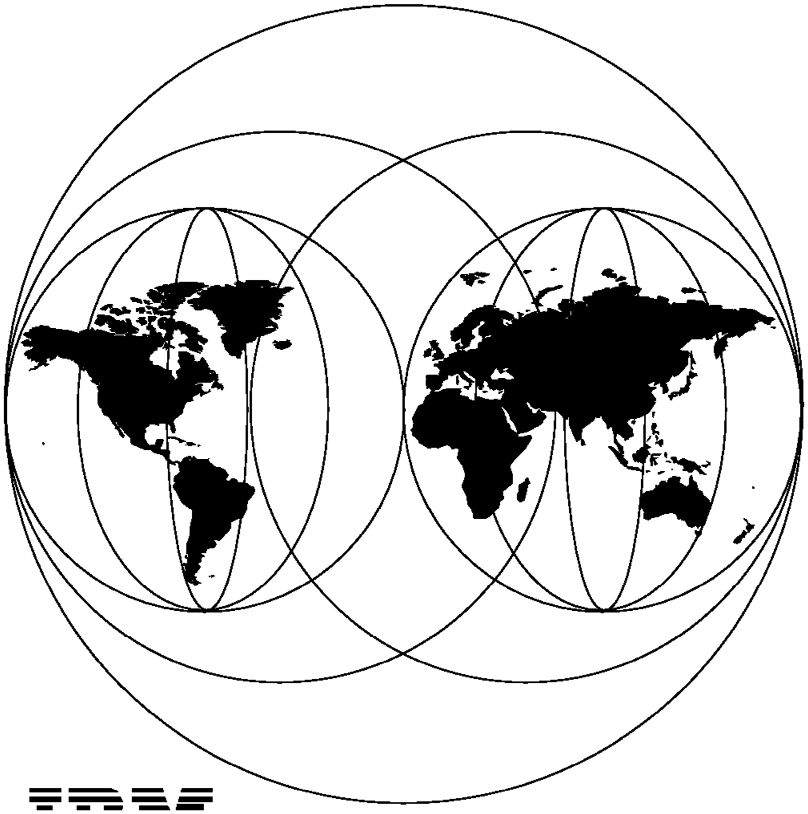
International Technical Support Organization

GG24-4385-00

CM/2 - SNA Phone Connect

March 1995



IBM

International Technical Support Organization
Raleigh Center

International Technical Support Organization

GG24-4385-00

CM/2 - SNA Phone Connect

March 1995

Take Note!

Before using this information and the product it supports, be sure to read the general information under "Special Notices" on page xv.

First Edition (March 1995)

This edition applies to Version 1.11 of Communications Manager/2, Program Number 5871-AAA for use with the IBM Operating System/2.

Order publications through your IBM representative or the IBM branch office serving your locality. Publications are not stocked at the address given below.

An ITSO Technical Bulletin Evaluation Form for reader′s feedback appears facing Chapter 1. If the form has been removed, comments may be addressed to:

IBM Corporation, International Technical Support Organization
Dept. 545 Building 657
P.O. Box 12195
Research Triangle Park, NC 27709-2195

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

© **Copyright International Business Machines Corporation 1995. All rights reserved.**
Note to U.S. Government Users — Documentation related to restricted rights — Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.

Abstract

This document describes the new SNA Phone Connect feature of IBM Communications Manager/2 Version 1.11. It is meant as a guide and tutorial to this new feature.

This document is intended for persons who already have some familiarity with previous releases of Communications Manager and who wish to quickly get familiar with this new feature of Version 1.11.

(258 pages)

© Copyright IBM Corp. 1995

Contents

Abstract . . . iii

Special Notices . . . xv

Preface . . . xvii
How This Document is Organized . . . xvii
Related Publications . . . xviii
International Technical Support Organization Publications . . . xviii
Acknowledgments . . . xix

Chapter 1. SNA Phone Connect Overview . . . 1
1.1 What Is SNA Phone Connect? . . . 1
1.2 Why SNA Phone Connect? . . . 3
1.3 Functions Provided by SNA Phone Connect . . . 4
  1.3.1 Asynchronous SNA Phone Connections . . . 4
  1.3.2 Synchronous SNA Phone Connections . . . 5
  1.3.3 AutoSync SNA Phone Connections . . . 6
  1.3.4 ISDN SNA Phone Connections . . . 7
  1.3.5 X.25 Enhancements . . . 7
1.4 SNA Phone Connect Components . . . 8
1.5 Call Status Window . . . 10

Chapter 2. CM/2 SNA Phone Connect Configuration . . . 11
2.1 Selecting Commonly Used Definitions . . . 11
2.2 Selecting Additional Definitions . . . 12
2.3 Quick Configuration . . . 13
2.4 Advanced Configuration . . . 19
  2.4.1 SNA Phone Connect - Port Connection Manager . . . 20
  2.4.2 SNA Phone Connect - Connection Manager . . . 26
  2.4.3 SNA Phone Connect - Protocol Driver . . . 32
  2.4.4 LAPS Configuration . . . 32
  2.4.5 DLC - SDLC Using SNA Phone Connection . . . 34
  2.4.6 SNA Local Node Characteristics . . . 35
  2.4.7 SNA Connections . . . 35
2.5 LAPS Configuration for WAC Adapter . . . 37
2.6 Telephone Directory . . . 41

Chapter 3. SNA Phone Connect Configuration Files . . . 43
3.1 Configuration Files . . . 43
3.2 File Relationships . . . 56
3.3 Standard COM Port and IRQ Level Definition . . . 60
3.4 Latest MPA Level . . . 60

Chapter 4. Configuration Example - Synchronous to a 3745 Using an MPA Adapter . . . 63
4.1 CM/2 Configuration Process . . . 63
4.2 Related Files . . . 66
  4.2.1 CONFIG.SYS . . . 66
  4.2.2 PROTOCOL.INI . . . 66
  4.2.3 NETWORK.INI . . . 67
  4.2.4 Example of Host Parameters Used for This Scenario (3745) . . . 67

© Copyright IBM Corp. 1995

Chapter 5. Configuration Example - Synchronous to a 3745 Using a WAC Adapter . . . 69
5.1 LAPS Configuration Process . . . 70
5.2 CM/2 Configuration Process . . . 75
5.3 Related Files . . . 77
  5.3.1 CONFIG.SYS . . . 77
  5.3.2 PROTOCOL.INI . . . 77
  5.3.3 NETWORK.INI . . . 78
  5.3.4 Example of Host Parameters Used for This Scenario (3745) . . . 78

Chapter 6. Configuration Example - Asynchronous to an AS/400 . . . 79
6.1 CM/2 Configuration Process . . . 79
6.2 Related Files . . . 83
  6.2.1 CONFIG.SYS . . . 83
  6.2.2 PROTOCOL.INI . . . 83
  6.2.3 NETWORK.INI . . . 84
  6.2.4 Example of AS/400 Configuration . . . 85
  6.2.5 Cabling Considerations . . . 86

Chapter 7. Configuration Example - APPC from PS/2 to PS/2 over an Asynchronous Connection . . . 89
7.1 CM/2 Configuration Process . . . 89
  7.1.1 Configuration for Workstation #1 . . . 89
  7.1.2 Configuration for Workstation Number 2 . . . 99
7.2 Testing the Newly Created Configurations . . . 99
7.3 Related Files . . . 100
  7.3.1 CONFIG.SYS . . . 100
  7.3.2 PROTOCOL.INI . . . 100
  7.3.3 NETWORK.INI . . . 101

Chapter 8. Configuration Example - SNA over Asynchronous to a CM/2 Gateway/Network Node . . . 103
8.1 Scenario Description . . . 103
  8.1.1 Physical Description . . . 103
  8.1.2 Logical Description . . . 103
8.2 Quick Configuration of the End Node . . . 104
8.3 PROTOCOL.INI and NETWORK.INI Entries . . . 107
8.4 PCM Configuration for Multiple Ports . . . 109
8.5 Gateway and Network Node Configuration . . . 110
  8.5.1 Port Connection Manager Configuration - Network Node . . . 112
  8.5.2 Connection Manager Configuration - Network Node . . . 112
  8.5.3 Protocol Driver Configuration - Network Node . . . 113
  8.5.4 SDLC DLC Using SNA Phone Connect - Network Node . . . 113
  8.5.5 Local Node Characteristics - Network Node . . . 114
  8.5.6 Gateway - Hosts and Hosts LU Pools . . . 114
  8.5.7 Implicit Workstation Using the Gateway . . . 114

Chapter 9. Configuration Example - ThinkPad with a PCMCIA Autosync Modem to a 3745 . . . 117
9.1 Special Considerations for PCMCIA . . . 117
9.2 Using PlayAtWill . . . 118
9.3 CM/2 Configuration Process . . . 120
9.4 Related Files . . . 123
  9.4.1 CONFIG.SYS . . . 123
  9.4.2 PROTOCOL.INI . . . 125

9.4.3 NETWORK.INI 126
9.4.4 Example of Host Parameters Used for This Scenario (3745) 126

Chapter 10. Communications Terminology and Tutorial 129
10.1 Half-Duplex/Full-Duplex Transmissions 130
10.1.1 Half-Duplex 130
10.1.2 Full-Duplex 130
10.2 Point-to-Point and Multipoint 131
10.3 Asynchronous and Synchronous 132
10.3.1 Asynchronous Communications 132
10.3.2 Synchronous Communications 133
10.3.3 Comparing Synchronous and Asynchronous Communications . . 133
10.4 Analog vs Digital 134
10.5 Modulation 134
10.5.1 Modulation Methods 135
10.6 Interfaces 138
10.6.1 EIA RS-232D or CCITT V.24/V.28 138
10.6.2 CCITT V.35 141
10.6.3 RS-422/449 or CCITT V.36(V.11) 143
10.6.4 CCITT X.21 145
10.7 Comparing NRZI Encoding Scheme to NRZ 147
10.8 SDLC Zero-Bit Insertion and Deletion 148

Chapter 11. The AT Command Set 149
11.1 Modem Attention Command Set (AT Command) 149
11.2 AT Commands 149
11.3 S-register 150
11.4 Result Codes 150
11.5 AT Commands Quick Reference 152
11.6 AT Commands Considerations and Examples 158
11.7 Data Compression 164
11.7.1 Compression Techniques 164
11.8 PM Terminal 164
11.9 Modem Leads 167
11.10 Modem Leads Descriptions 169
11.11 CCITT V.25 bis 170

Chapter 12. Communications Manager/2 SNA Phone Connect Environment 173
12.1 SNA Phone Connect - Major Components and Interfaces 173
12.2 Main Events at OS/2 Boot Time 177
12.2.1 LAPS Overview 178
12.2.2 SNA Phone Connect NDIS MAC Support 178
12.2.3 PROTOCOL.INI File 182
12.3 Main Events at CM/2 Start Time 187
12.4 Outgoing Call and Incoming Call Flow Examples 191
12.4.1 Outgoing Call 191
12.4.2 Incoming Call 195

Chapter 13. Problem Determination for SNA Phone Connect 197
13.1 Message Log Formatter 197
13.2 CM/2 Tracing 199
13.2.1 APIs and Primitives 202
13.2.2 Sample Trace of CM/2 Startup 206
13.2.3 Sample Trace of an Outgoing Call 213
13.2.4 Sample Trace of a Failed Outgoing Call 220

13.3 PD Hints and Tips 223
  13.3.1 SNA Phone Connect Checklist 224
  13.3.2 OS/2 Boot Errors 224
  13.3.3 CM/2 Start Errors 225
  13.3.4 Link Does Not Activate 226
  13.3.5 Link Has Dropped 229

Appendix A. Hints and Tips and Restrictions 231
A.1 Using the WAC Adapter 231
A.2 Using the MPA Adapter 231
A.3 PCMCIA Modem 232
A.4 General SNA Phone Connect 232
A.5 Modems 232
A.6 AS/400 233
A.7 Restrictions 234

Appendix B. Communications Manager/2 Reference Summary 235

Index 257

Figures

1. Example of Asynchronous and AutoSync Connections 2
2. Example of Synchronous Connections Using MPA and WAC Adapters . 3
3. Example of Autosync Connections 6
4. Simplified CM/2 Components Summary 8
5. New Main Configuration Window 11
6. Main Configuration Window from Previous Release 12
7. CM/2 First Window of Quick Configuration 14
8. CM/2 Second Window of Quick Configuration 15
9. Pre-filled Port Name and Encoding Scheme 15
10. CM/2 First Window of Quick Configuration 17
11. CM/2 Second Window of Quick Configuration 18
12. CM/2 Advanced Configuration Window 20
13. PCM Configuration Window 21
14. IBM 7855 Modem Parameters 22
15. PCM Selection for Asynchronous Non-Switched 24
16. PCM Selection for Synchronous Switched 24
17. PCM Selection for Synchronous Non-Switched 25
18. PCM Selection for AutoSync 25
19. PCM Selection for ISDN 26
20. Connection Manager Window 26
21. Outgoing Call Directory Entry 27
22. Modem/Line Characteristics 28
23. Called Party Number 29
24. Creating Incoming Call Directory Entry Window 29
25. Incoming Call Directory Entry Name 30
26. Incoming Call Directory Entry 30
27. Unspecified Modem/Line Characteristic 31
28. PCM and CM Local Phone Number Definition 31
29. To Update PROTOCOL.INI 32
30. LAPS Configuration 33
31. COM Port Parameters 33
32. DLC - SDLC SNA Phone Connect 34
33. Local Node Characteristics 35
34. Local Node Options 35
35. SNA Connections 36
36. Adapter List 36
37. Connection to a Peer Node 37
38. Installing OS/2 WAC Device Driver 38
39. Installation Completed Message 38
40. Configuring MAC for WAC Adapter 39
41. WAC Parameters 40
42. Telephone Directory 42
43. Telephone Number 42
44. Configuration Files and Their Relationships 43
45. Sample of NETWORK.INI 45
46. Sample of PROTOCOL.INI 47
47. Sample PIF File 49
48. IBM 7855 PCM Panel 50
49. Sample NIF File 52
50. COMMAC Parameters 53
51. Sample DDF File 55

© Copyright IBM Corp. 1995

52. NETWORK.INI Update 56
53. NETWORK.INI, PIF File, and PROTOCOL.INI Relationship 57
54. PIF File, NIF File and PROTOCOL.INI Relationship 58
55. DDF File and PROTOCOL.INI Relationship 59
56. 3270 Emulation - Synchronous Switched SNA Phone Connect to a 3745 63
57. 3270 Emulation Using SNA Phone Connections 64
58. Modem Connection Information 65
59. 3270 Emulation - Synchronous Leased Line with a WAC Adapter 69
60. Configuring LAN Transports for WAC Adapter 71
61. Parameters for IBM WAC Adapter 72
62. 3270 Emulation Using SNA Phone Connections 75
63. Modem Connection Information 76
64. 5250 Emulation - Asynchronous Switched to an AS/400 79
65. Communications Manager Configuration Definition 80
66. 5250 Emulation Using SNA Phone Connections 81
67. Modem Connection Information 82
68. AS/400 and PS/2 Connection 86
69. ASCII Controller to Modem Cable 87
70. APPC Application Using Asynchronous Communications 89
71. Advanced Configuration for APPC Application 90
72. CM/2 Profile List 91
73. PCM Configuration 91
74. Parameters for IBM 7855 Modem 92
75. Connection Manager Configuration 93
76. Outgoing Call Directory Entry 93
77. Modem/Line Characteristics 94
78. Called Party Number 94
79. Create Incoming Call Entry 94
80. Incoming Call Entry Name 95
81. SDLC DLC SNA Phone Connections Configuration 95
82. SNA Local Node Characteristics 96
83. Connection List 97
84. Adapter List 97
85. Connection to a Peer Node 98
86. Workstation 2 - Local Node Name 99
87. SNA over Asynchronous to a CM/2 Gateway 103
88. SNA over Asynchronous Example - Logical View 104
89. 3270 Emulation Using SNA Phone Connect Quick Configuration - Panel 1 105
90. 3270 Emulation using SNA Phone Connect Quick Configuration - Panel 2 105
91. 5250 Emulation Using SNA Phone Connect Quick Configuration - Panel 1 106
92. 5250 Emulation Using SNA Phone Connect Quick Configuration - Panel 2 107
93. PROTOCOL.INI and NETWORK.INI for SNA over ASYNC 108
94. PROTOCOL.INI and NETWORK.INI for Multiple Ports 110
95. CM/2 Additional Definitions Panel 111
96. CM/2 Profile List 111
97. IBM5853 PCM Configuration Panel 112
98. Incoming Call Directory Entry Defaults 112
99. Incoming Call Directory Entry Name 113
100. Connection Manager Main Panel 113
101. DLC - SDLC Using SNA Phone Connect 114
102. Implicit Workstations Panel 115

103. Implicit Workstations LUs 115
104. Implicit Workstations LU Definition 116
105. 3270 Emulation using a PCMCIA autosync modem to a 3745 117
106. PlayAtWill 119
107. PlayAtWill with One PCMCIA Inserted 119
108. 3270 Emulation Using SNA Phone Connections 121
109. Modem Connection Information 122
110. Digital/Analog Communications and the Role of the Modem 129
111. Half-Duplex 130
112. Full-Duplex 131
113. A Point-to-Point Line 131
114. A Multipoint Line 132
115. Asynchronous Character 133
116. Analog and Digital 134
117. Amplitude Modulation 135
118. Frequency Modulation 135
119. Phase Modulation 136
120. Analog Environment - Summary of Terms and Standards 138
121. RS-232D Connector Pins 139
122. RS-232 DCE Connector 140
123. V.35 Connector Pins 142
124. V.35 DCE Connector 143
125. RS-422 Connector Pins 144
126. RS-422 DCE Connector 145
127. X.21 Connector Pins 146
128. X.21 DCE Connector 146
129. X.21 Communications Establishment 147
130. Modem Configuration Profiles 152
131. Session Phonebook 165
132. Admittance Data 166
133. AT Command Screen 166
134. AT Command Example 167
135. DTE and DCE Communications 167
136. Switched Full-Duplex Communication 168
137. Leased Full-Duplex Communication 169
138. SNA Phone Connect - Major Components and Interfaces 177
139. LAPS Relationship to LAN Application 178
140. X.25 Protocol Driver Configuration Panel 180
141. SDLC Protocol Driver Configuration Panel 180
142. Protocol and MAC Drivers Relationship Summary 182
143. Sample PROTOCOL.INI File 185
144. Sample NETWORK.INI File 188
145. Connection Manager and PCM Activation Flows 190
146. CMQUERY Command Showing SNA Phone Connect as Active 191
147. Call Status Window -Calling- 192
148. Call Status Window -Connect- 193
149. How the PCM and Connection Manager Work when Making an Outgoing Call 194
150. Connection Manager and PCM Activation Flow when Making an Outgoing Call 195
151. Connection Manager and PCM Activation Flow when Accepting an Incoming Call 196
152. Message Log Formatter Panel 198
153. Message Log Formatter Detail Panel -Example 1- 198
154. A Part of OSI Layer Model that Communications Manager Implements 199

155. Problem Determination Aids -Trace- 200
156. Selectable Trace Points 201
157. Primitive Flows between Each Interface 205
158. Sample CM/2 Starting Trace (1 of 6) 207
159. Sample CM/2 Starting Trace (2 of 6) 208
160. Sample CM/2 Starting Trace (3 of 6) 209
161. Sample CM/2 Starting Trace (4 of 6) 210
162. Sample CM/2 Starting Trace (5 of 6) 211
163. Sample CM/2 Starting Trace (6 of 6) 212
164. Sample Configuration 213
165. Sample Outgoing Call Trace (1 of 6) 214
166. Sample Outgoing Call Trace (2 of 6) 215
167. Sample Outgoing Call Trace (3 of 6) 216
168. Sample Outgoing Call Trace (4 of 6) 217
169. Sample Outgoing Call Trace (5 of 6) 218
170. Sample Outgoing Call Trace (6 of 6) 219
171. Sample Outgoing Call Trace -Failure 1- (1 of 2) 221
172. Sample Outgoing Call Trace -Failure 1- (2 of 2) 222
173. Sample Outgoing Call Trace -Failure 2- 223
174. DIP Switches Settings 225
175. CM Components and APIs (See CM/2 Information and Planning Guide) 252
176. SNA Phone Connect Components 253
177. CD-ROM Structure 254
178. SYSLEVEL Data 255
179. SNA Phone Connect Connectivity Summary 256

Tables

1. DDF and Its Corresponding Type of Connection 53
2. MPA Adapter Card Levels 60
3. Protocol Type and Corresponding Protocol Driver 180
4. Protocol Type and Corresponding MAC Driver 181
5. Sample Configuration for LAPS 183
6. Sample Configuration for SNA Phone Connect 183
7. CMI Primitives 203
8. GCCI Primitives 203
9. Product Order Information Summary (US Version) (See Announcement letter) 235
10. CM/2 Version 1.1 Product Publications (See CM/2 Information and Planning Guide) 236
11. Communications Manager ITSO (Redbook) Publications 236
12. CM/2 Connectivity Summary 237
13. Available APIs 238
14. Line Speeds (See CM/2 Information and Planning Guide) 238
15. SNA Gateway Summary (See CM/2 Information and Planning Guide) . 239
16. APPN Support (See CM/2 Information and Planning Guide) 239
17. Supported Adapters (See CM/2 Information and Planning Guide) . . . 240
18. New or Modified Commands. Details in Online Command Reference. 241
19. CONFIG.SYS Statements (See also Online Command Reference) . . . 242
20. Configuration Files 243
21. Log and Error Files 243
22. Memory Requirements (MB) (See CM/2 Information and Planning Guide) 243
23. Supported Keyboards 244
24. Verbs Summary 244
25. Additional CM/2 Functions 245
26. Productivity Aids Shipped with CM/2 245
27. Maximum Link Activation Attempts Defaults 246
28. Enhancements Introduced in Extended Services - Fall 92 246
29. Enhancements Introduced in CM/2 Version 1.0 - Feb 93 247
30. Enhancements Introduced in CM/2 Version 1.1 - Nov 93 247
31. Enhancements Introduced in CM/2 Version 1.11 - May 94 248
32. NDF Configuration File Summary (See Online CMVERIFY.TXT) 248

© Copyright IBM Corp. 1995

Special Notices

This publication is intended to help customers and IBMers understand the new feature called SNA Phone Connect which is made available with the version 1.11 of Communications Manager/2. The information in this publication is not intended as the specification of any programming interfaces that are provided by IBM Communications Manager/2. See the PUBLICATIONS section of the IBM Programming Announcement for IBM Communications Manager/2 Version 1.1 for more information about what publications are considered to be product documentation.

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM′s product, program, or service may be used. Any functionally equivalent program that does not infringe any of IBM′s intellectual property rights may be used instead of the IBM product, program or service.

Information in this book was developed in conjunction with use of the equipment specified, and is limited in application to those specific hardware and software products and levels.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood, NY 10594 USA.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS. The use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer′s ability to evaluate and integrate them into the customer′s operational environment. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

The following terms are trademarks of the International Business Machines Corporation in the United States and/or other countries:

AnyNet
APPN
AS/400
AT
BookManager
Extended Services
FFST
FFST/2
GDDM
IBM
LAN Distance
Micro Channel
OS/2
Personal Computer AT
Portmaster
PS/1
PS/2
RT
S/370
SAA
ThinkPad
VTAM

The following terms are trademarks of other companies:

Windows is a trademark of Microsoft Corporation.

© Copyright IBM Corp. 1995

PC Direct is a trademark of Ziff Communications Company and is used by IBM Corporation under license.

UNIX is a registered trademark in the United States and other countries licensed exclusively through X/Open Company Limited.

AT&T	American Telephone and Telegraph Company
ATI	ATI Technologies, Incorporated
Attachmate	Attachmate Corporation
Apple	Apple Computer, Incorporated
Advanced 3270 Adapter/2	Attachmate Corporation
DCE	The Open Software Foundation
DCA	Digital Communications Associates, Incorporated
NDIS	3Com Corporation and Microsoft Corporation
NetWare, Novell	Novell, Incorporated
PCMCIA	Personal Computer Memory Card International Association
Touch-Tone	American Telephone and Telegraph Company
ULTRA	ATI Technologies Incorporated
3Com	3Com Corporation

Other trademarks are trademarks of their respective companies.

Preface

This document is intended to quickly familiarize the reader with a new feature called SNA Phone Connect available with Communications Manager/2 Version 1.11, which is an update of the previous release, that is Version 1.1.

This document is intended for persons already familiar with previous releases of this product, and who need to quickly gain an understanding of the new capabilities it offers.

It is not meant to replace the product publications. Any duplication with the available product documentation has been minimized, and this document should therefore be used only as a supplement to the available product publications.

The ITSC bulletin, prior to this one, which covered the previous release of Communications Manager/2 was entitled *Communications Manager/2 Version 1.1 Enhancements* (GG24-4142).

How This Document is Organized

The document is organized as follows:

- Chapter 1, "SNA Phone Connect Overview"

  This provides a short introduction and a brief overview of the new SNA Phone Connect feature of IBM Communications Manager/2 Version 1.11.

- Chapter 2, "CM/2 SNA Phone Connect Configuration"

  This provides a general description on how to configure the SNA Phone Connect feature.

- Chapter 3, "SNA Phone Connect Configuration Files"

  This provides a discussion of the configuration files involved in the SNA Phone Connect feature configuration and how they are used.

- Chapter 4, "Configuration Example - Synchronous to a 3745 Using an MPA Adapter"

  This provides a specific SNA Phone Connect configuration example for a 3270 emulation scenario using a synchronous switched connection to a 3745 and the IBM Multiprotocol adapter card on the workstation.

- Chapter 5, "Configuration Example - Synchronous to a 3745 Using a WAC Adapter"

  This provides a specific SNA Phone Connect configuration example for a 3270 emulation scenario using a synchronous leased connection to a 3745 and the IBM Wide Area Connector adapter card.

- Chapter 6, "Configuration Example - Asynchronous to an AS/400"

  This provides a specific SNA Phone Connect configuration example for a 5250 emulation scenario using an asynchronous switched connection to an AS/400 through a COM port (SNA over asynchronous).

- Chapter 7, "Configuration Example - APPC from PS/2 to PS/2 over an Asynchronous Connection"

© Copyright IBM Corp. 1995

This provides a specific SNA Phone Connect configuration example for an APPC session using an asynchronous switched connection from a PS/2 to another PS/2 through a COM port.

- Chapter 9, “Configuration Example - ThinkPad with a PCMCIA Autosync Modem to a 3745”

  This provides a specific SNA Phone Connect configuration example for a 3270 emulation scenario using an autosync switched connection from a ThinkPad to a 3745 and an IBM PCMCIA Fax/Data Modem adapter.

- Chapter 10, “Communications Terminology and Tutorial”

  This provides a brief review and discussion of some of the basic communications concepts that might be useful to a beginner in order to better understand the SNA Phone Connect feature.

- Chapter 11, “The AT Command Set”

  This provides a brief introduction and tutorial on the AT commands used by most modems. This is meant for the beginner, to give him a basic understanding of some of the commends used by the SNA Phone Connect feature.

- Chapter 12, “Communications Manager/2 SNA Phone Connect Environment”

  This provides an overview of the major components that make up the SNA Phone Connect feature, and of some of the more inportant flows between some of these components. The intent is to give the reader enough insight into the structure in order to allow him to better understand the sequence of events that are required for getting active connections.

- Chapter 13, “Problem Determination for SNA Phone Connect”

  This provides a brief introduction into some of the problem determination steps that a user can take in order to isolate problems.

- Appendix A, “Hints and Tips and Restrictions”

  A brief summary of some items that might help the user configure and use the SNA Phone Connect feature.

- Appendix B, “Communications Manager/2 Reference Summary”

  A reference summary listing, in table format, highlighting some of the most important data on CM/2. This is to be used as a condensed guide to some of CM/2′s capabilities.

Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this document.

- *AS/400 Physical Planning Guide and Reference*, GA41-9571

International Technical Support Organization Publications

The following are ITSO publications referenced in this document:

- *Communications Manager/2 Version 1.1 Enhancements*, GG24-4142

A complete list of International Technical Support Organization publications, with a brief description of each, may be found in:

International Technical Support Organization Bibliography of Redbooks, GG24-3070.

To get listings of ITSO technical bulletins (redbooks) online, VNET users may type:

```
TOOLS SENDTO WTSCPOK TOOLS REDBOOKS GET REDBOOKS CATALOG
```

How to Order ITSO Technical Bulletins (Redbooks)

IBM employees in the USA may order ITSO books and CD-ROMs using PUBORDER. Customers in the USA may order by calling 1-800-879-2755 or by faxing 1-800-284-4721. Visa and Master Cards are accepted. Outside the USA, customers should contact their IBM branch office.

Customers may order hardcopy redbooks individually or in customized sets, called GBOFs, which relate to specific functions of interest. IBM employees and customers may also order redbooks in online format on CD-ROM collections, which contain the redbooks for multiple products.

Acknowledgments

The advisor for this project was:

Claude Béchard
International Technical Support Organization, Raleigh Center

The authors of this document are:

Claude Béchard
International Technical Support Organization, Raleigh Center

Vlamir Freitas
IBM Brazil

Shinji Ichikawa
IBM Japan

Melinda Wong
IBM Hong Kong

Special contributors who provided much of the base material from which this document was written and who provided guidance and assistance during its writing:

Pratik Nanavati
Research Triangle Park

Ly Sauer
Research Triangle Park

This publication is the result of a residency conducted at the International Technical Support Organization, Raleigh Center.

Thanks to the following people for the invaluable advice and guidance provided in the production of this document:

Gray Heffner
International Technical Support Organization, Raleigh Center

Shawn Walsh
International Technical Support Organization, Raleigh Center

Volkert Kreuk
International Technical Support Organization, Raleigh Center

Michael Webb
Research Triangle Park

Chapter 1. SNA Phone Connect Overview

IBM Communications Manager/2 Version 1.11 introduces a significant new feature called SNA Phone Connect.

This chapter provides an overview of this new feature, including what it is, what functions it provides, as well as a brief description of the components which make up this new feature.

A more detailed description of the configuration windows, profiles, and configuration files related to SNA Phone Connect can be found in Chapter 2, "CM/2 SNA Phone Connect Configuration" on page 11 and Chapter 3, "SNA Phone Connect Configuration Files" on page 43.

1.1 What Is SNA Phone Connect?

SNA Phone Connect is a new feature of CM/2 Version 1.11 which allows the use of CM/2′s SNA applications from home or while traveling, or in fact from anywhere a telephone line connection is available.

It performs switched auto-dial/auto-answer and permanent connection bring-up and take-down. Previously, the use of switched synchronous connections was possible but calls had to be either dialed manually (except for ISDN) or dialed by modems with special features, which could be impractical in many cases.

A CM/2 workstation can now automatically dial or call a remote system once SNA Phone Connect is configured and CM/2 is started. The auto-answer function will allow CM/2 to accept incoming calls automatically when properly configured.

These facilities apply as well to permanent connections which can be brought up and taken down by CM/2.

Important

The SNA Phone Connect feature provided by CM/2 (V1.11) will only work with OS/2 Version 2.0 or above, and the LAPS code should be WR07020 or higher to be able to use SNA Phone Connect.

SNA Phone Connect supports both the SDLC and X.25 protocols over the following facilities:

1. Synchronous modems via synchronous communications devices/adapters, such as the Multiprotocol Adapter (MPA). (Note that the X.25 protocol however cannot be used when using an MPA.) Please refer to 3.4, "Latest MPA Level" on page 60 for the level of MPA adapters required to operate with SNA Phone Connect.
2. Synchronous CSU/DSU via synchronous communications devices/adapters, such as the Wide Area Connector (WAC) adapter.
3. Asynchronous modems via asynchronous communications devices/adapters, such as a COM port or any adapter configured as a serial port. (X.25 cannot be used over async circuits.)

© Copyright IBM Corp. 1995

4. AutoSync modems via asynchronous communications devices/adapters, such as a COM port or any adapter configured as a serial port.
5. ISDN devices/adapters.

In the past, the use of SNA applications, (that is, using synchronous layer 2 protocols such as SDLC), was restricted to synchronous adapters which are more expensive than asynchronous adapters.

A significant advantage provided by SNA Phone Connect is the ability to use these SNA applications, without any change, over asynchronous adapters (commonly called SNA over Asynch).

With SNA Phone Connect, a user can configure a workstation or laptop to use its standard serial communications port with a modem for the asynchronous and autosync connections.

This means that any user can dial into a remote system from anywhere, at anytime, as long as there is a telephone line available with access to the public switched telephone network.

Shown below in Figure 1 is an example of 2 connections using the serial communication port, with the appropriate modem connections. The diagram at the top shows a traditional connections using a COM port, an asynchronous modem, and an asynchronous line to communicate with another asynchronous modem at the remote end.

The bottom portion of the diagram also shows the use of a COM port, but this time being used with an autosync modem, which communicates using a synchronous circuit to a synchronous modem at the remote end. This configuration, in effect, uses allows the use of a synchronous circuit without the need for a synchronous adapter in the PC.

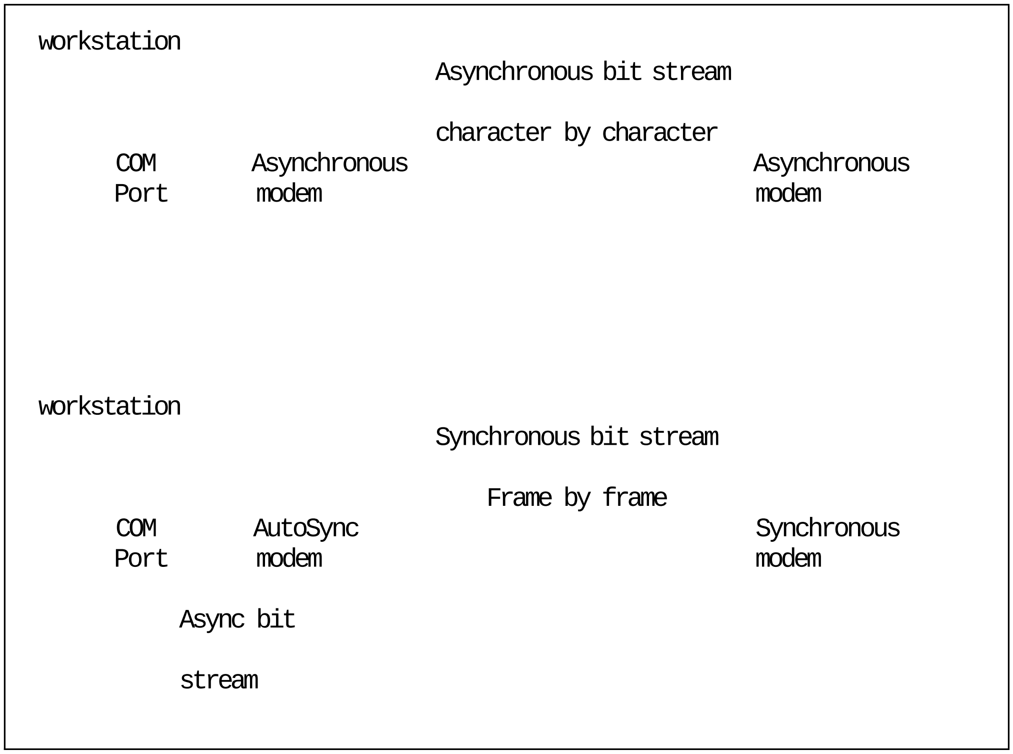


Figure 1. Example of Asynchronous and AutoSync Connections

In Figure 2 on page 3 below are examples of synchronous connections using a synchronous adapter and a synchronous modem. The supported synchronous adapters are the IBM Multiprotocol Adapter (MPA) and the IBM Wide Area Connector (WAC) adapter.

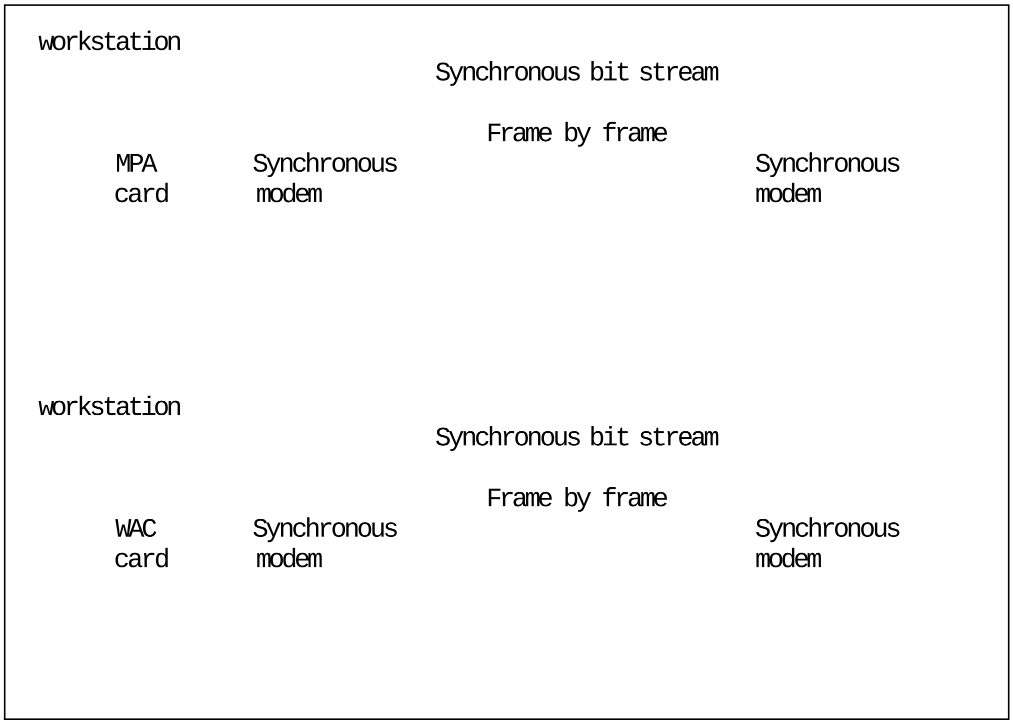


Figure 2. Example of Synchronous Connections Using MPA and WAC Adapters

1.2 Why SNA Phone Connect?

The previous version of CM/2 (V1.1) supported synchronous modem connections; however, there was no auto-dial support, the line speed was limited to 19.2 Kbps, and only an IBM MPA adapter for Micro Channel machines and an IBM SDLC adapter for AT/ISA bus machines were supported.

With the SNA Phone Connect function, CM/2 now supports synchronous modem connections, with auto-dial support, a maximum speed of 64 Kbps, as well as asynchronous and autosync connections.

The benefits provided by SNA Phone Connect are as follows:

- Software controlled dialing with
  - Efficient call management
  - Easy way to program or change telephone numbers

    CM/2 1.11 provides a tool to change telephone numbers that have been previously configured without the need to use the configuration process again.
  - Alternate telephone number re-dial after a busy tone

    Alternate telephone numbers to be automatically dialed when the primary number is busy can be configured.
- Access SNA applications from anywhere (that is, mobile/home computing).

Any SNA application, such as 3270 emulation or 5250 emulation, can be accessed from anywhere; business travellers can now access their office network from a hotel room or even a car, as long as there is a telephone line available.

- Unchanged SNA/APPC applications.

  There is no need to change anything in the SNA application in order to take advantage of SNA Phone Connect.

- Cost effective by using switched line instead of leased line (dial-up connections for remote branch offices).
- Support for high-speed digital and leased SDLC lines (up to 64 Kbps) for high volume data traffic.
- ISDN support combines high speed, standardization, quick call setup procedures, etc.
- Able to use the COM port for asynchronous and autosync connections, thereby requiring less costly adapters.

  You do not need to install any adapter to be able to have a synchronous connection, since an autosync connection is actually a synchronous connection provided by an autosync modem.

1.3 Functions Provided by SNA Phone Connect

SNA Phone Connect supports the following six types of connection:

1. Asynchronous switched
2. Asynchronous non-switched
3. Synchronous switched
4. Synchronous non-switched
5. AutoSync
6. ISDN

1.3.1 Asynchronous SNA Phone Connections

Asynchronous SNA Phone Connections support speeds up to 57.6 Kbps with an appropriate (V.42bis) modem.

It can be configured to use a serial communications port (COM port), or any other adapter card configured as a serial port, such as the IBM PS/2 MPA Adapter/A, IBM PS/2 Dual Asynchronous Adapter/A, or an internal modem.

Asynchronous SNA Phone Connections are supported by all modems which are 100% compatible with the Hayes AT command set. CM/2 provides preconfigured modem initialization and command strings for more than 100 specific modems. Refer to the CM2111 package in MKTTOOLS or *What's New* document in the CM/2 folder for a complete listing of supported and pre-configured modems.

If your modem is not in the list of supported modems, a generic profile can be used during configuration to identify the appropriate and required modem command strings. To do so, select **User-Defined Asynchronous Switched Connection Modem** in the SNA Phone Connect - Port Connection Manager profile of the CM/2 configuration.

Connections supported by SNA Phone Connect in a switched asynchronous environment are as follows:

1. To an Advantis network for 5250 emulation and LU 6.2 applications
2. To an AS/400 host for 5250 emulation, LU 6.2 applications, or 3270 emulation using pass-through to a S/370 host
3. To another system running CM/2 features or applications, such as an SNA gateway or APPN node

CM/2 supports two framing standards for using SNA over asynchronous:

1. AWP0224 - IBM standard
2. ISO3309 - ISO standard

Use AWP0224 for connection to an AS/400 or to the Advantis network, and use ISO3309 for connection to OS/2 and other systems. This is specified when you configure an outgoing call directory entry in the Connection Manager profile.

Important - Please Note

3270 emulation to an S/370 is not supported using asynchronous switched connections since an S/370 does not yet implement the support for SNA over asynchronous.

This means that you cannot dial into a 3745 for example in order to do 3270 emulation. You would need to dial into an SNA gateway for example, or an AS/400 with 3270 pass-through.

Note as well that if you want to use a CM/2 SNA gateway for example, you can only use up to two COM ports or adapters at the same time because you can only configure two SDLC ports. This is a CM/2 limitation which is very well understood and which is planned to be fixed in the near future.

1.3.2 Synchronous SNA Phone Connections

Synchronous SNA Phone Connections support V.25bis (bit-oriented) auto-dial protocols; therefore, CM/2 can be configured to use any synchronous modem that supports V.25bis.

Synchronous SNA Phone Connections support uses:

1. An IBM MPA adapter for switched connections only, with speeds up to 19.2 Kbps. For non-switched connections, the old SDLC support (non-SNA Phone Connect) of CM/2 is utilized,

   Note: When the traditional SLC support is configured (non SNA Phone Connect), the device driver statement appearing in CONFIG.SYS will be SDLCDD.SYS instead of the MPADD.SYS device driver used by SNA Phone Connect for switched connections. We mention this here because this has created some confusion in many cases.

2. An IBM WAC adapter for high speeds in switched and non-switched connections.

CM/2 supports two physical interfaces on the IBM WAC adapter for switched connections:

- RS-232D/V.24 interface for data transfer rates up to 19.2 Kbps
- V.35 interface for data transfer rates up to 64 Kbps

In non-switched environments, CM/2 supports four physical interfaces on the IBM WAC adapter as follows:

- RS-232D/V.24 interface for data transfer rates up to 19.2 Kbps
- RS-422/449 interface for data transfer rates up to 1.544 Mbps
- V.35 interface for data transfer rates up to 2.048 Mbps
- X.21 interface for data transfer rates up to 2.048 Mbps

Note

SNA Phone Connect only supports speeds up to 64 Kbps, even though the physical interfaces are capable of data transfer rates of up to 2.048 Mbps.

Only two SDLC ports can be used at the same time. So, even if you use two WAC adapter cards, which gives you four potential ports, still only two ports can be used simultaneously, but it can be one port from each adapter card.

IBM WAC MAC Version 2.x is required to support auto-dial capabilities.

Connections supported by SNA Phone Connect in switched synchronous environments are as follows:

1. To an Advantis network for 3270 emulation
2. To an S/370 host system
3. To an AS/400 host for 5250 emulation, LU 6.2 applications, or 3270 emulation using pass-through to an S/370 host
4. To another system running CM/2 features or applications, such as an SNA gateway or APPN node
5. To public or private X.25 networks (by using a WAC adapter card only since no support is provided by the MPA for X.25)

1.3.3 AutoSync SNA Phone Connections

The autosync capability in SNA Phone Connect enables a standard serial communications port (COM Port) and a Hayes autosync compatible modem to connect to a synchronous modem or another Hayes autosync modem at the remote end.

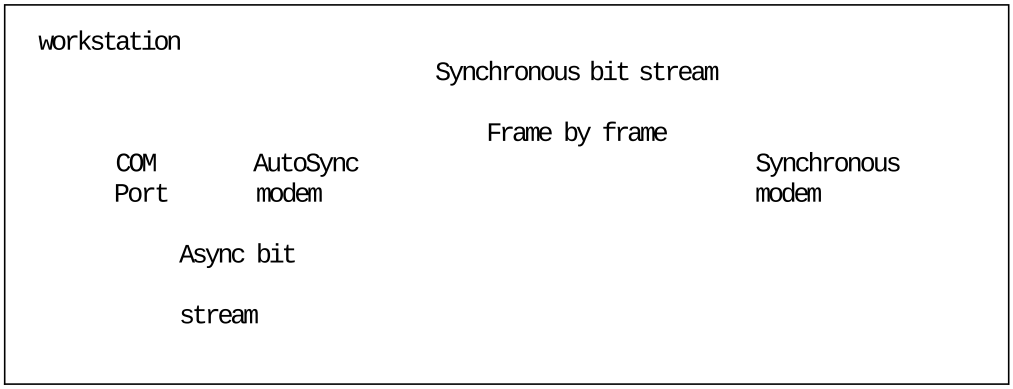


Figure 3. Example of Autosync Connections

An autosync modem converts an asynchronous bit stream (provided by the PC over a COM port) into a synchronous bit stream; therefore, from the remote modem's perspective, it is the same as using a synchronous adapter and a synchronous modem.

The main advantage is that a more expensive synchronous adapter is not required, because the serial COM port is used instead. Previously, to connect a synchronous modem at the remote end, you had to have a synchronous communications adapter and a synchronous modem on the local machine.

AutoSync connections support uses a serial communications port (COM Port), as well as other adapter cards configured as serial ports, such as the IBM PS/2 MPA Adapter/A, IBM PS/2 Dual Asynchronous Adapter/A, or internal modem.

AutoSync connections can be supported by all 100% Hayes autosync compatible modems. CM/2 provides pre-configured modem initialization strings, and other strings, for many of these modems. Refer to the *CM2111* package in *MKTTOOLS* or *What's New* document in the CM/2 folder for a listing of the modems supported.

If your modem is not in the list of supported modems, there is a generic definition that can be used. To do so, select **User-Defined AutoSync Switched Connection Modem** in the SNA Phone Connect - Port Connection Manager profile of the CM/2 configuration process.

Connections supported by SNA Phone Connect in a switched autosync environment are as follows:

1. To an Advantis network for 3270 emulation
2. To an AS/400 host for 5250 emulation, LU 6.2 applications
3. To an S/370 host system
4. To another system running CM/2 features or applications, such as an SNA gateway or APPN node
5. To public or private X.25 networks

Note: Autosync supports a maximum speed of 19.2 Kbps only.

1.3.4 ISDN SNA Phone Connections

The support for ISDN switched connections has not changed from the previous release of CM/2, apart from being integrated now into the Phone Connect feature, since ISDN is a switched wide area type of connection.

1.3.5 X.25 Enhancements

Version 1.11 of CM/2 includes a few X.25 enhancements, one of which pertains to SNA Phone Connect, that is, the X.32 support which allows switched connections to an X.25 network.

The SNA Phone Connect facilities can therefore be used to auto-dial a connection to an X.25 network.

Note

This means that you can use a COM port and an autosync modem to establish a connection to the X.25 network, using the SNA Phone Connect facilities.

1.4 SNA Phone Connect Components

The following diagram illustrates an overview of some of the major new components related to the SNA Phone Connect feature. It has been simplified in order to present only a higher level description of the components. A more detailed diagram will be seen later in Figure 138 on page 177.

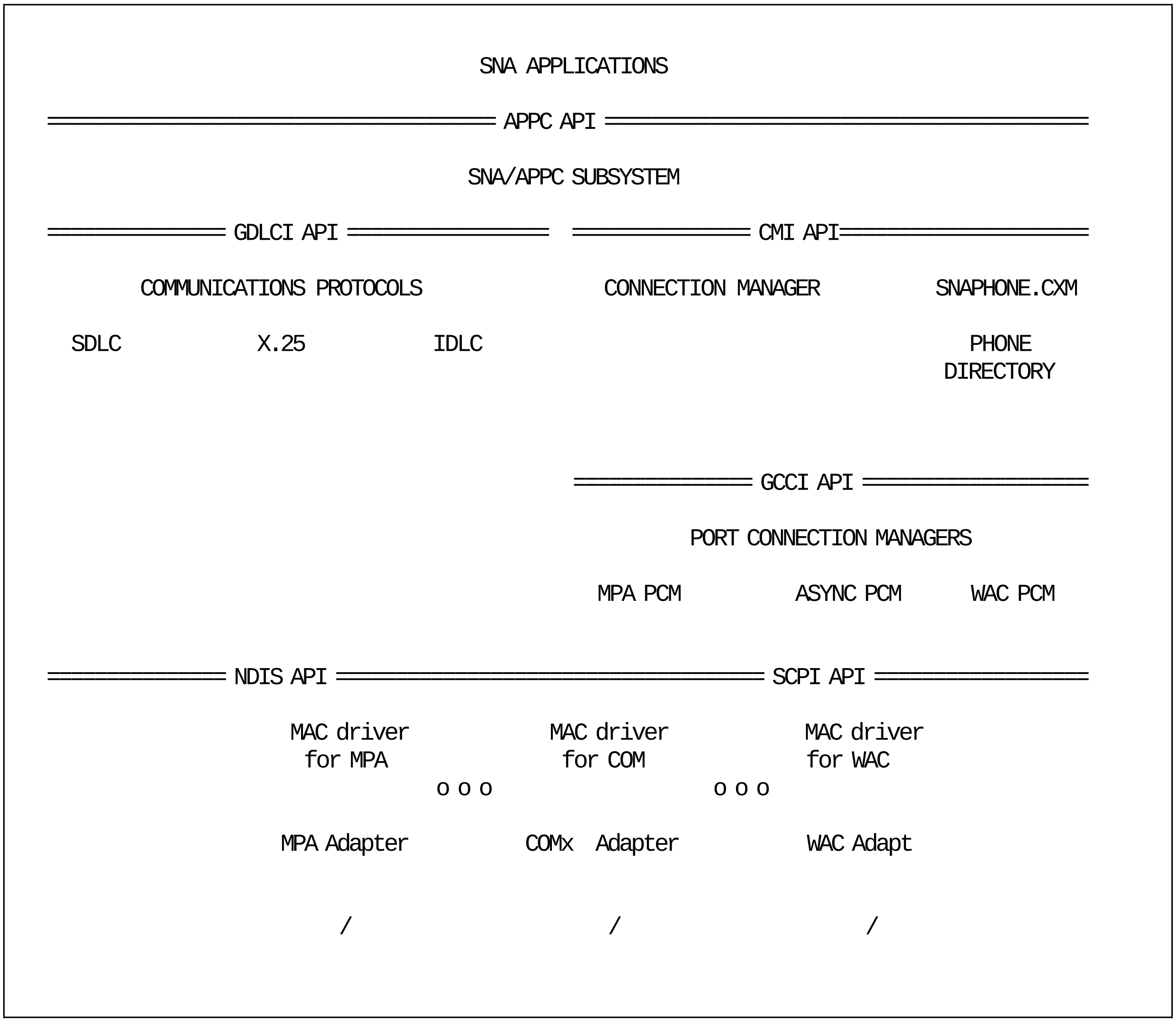


Figure 4. Simplified CM/2 Components Summary

- **SNA Applications**

  SNA/APPC applications that want to establish communications with other applications in remote nodes do so by requesting services from the SNA/APPC subsystem through the APPC API.

- **SNA/APPC Subsystem**

  This is the component responsible for activating links to other nodes for example. If an application issues a request for communication, the SNA/APPC subsystem ensures that the resources necessary for that request are activated and made available.

When a connection is required, the SNA subsystem requests the services of the Connection Manager through an API called the Connection Manager Interface (CMI) and it communicates with the appropriate protocol stack through an API called the Generalized Data Link Control Interface (GDLCI) API.

- **Protocols**

  There are three protocols that can be used by these applications: SDLC, X.25 or IDLC, and these are commonly known as the protocol stacks. Once a connection is established with another node, these are the components which sit at each end of the link and control what happens on the link; they are responsible for transmitting and receiving data according to an agreed set of rules called a protocol.

- **Connection Manager**

  Think of the Connection Manager as an automated telephone operator. The telephone operator receives requests from clients asking to be connected to other users. In order to satisfy requests, the operator has a telephone directory containing the number to be dialed to reach a specific requested user and it also has a directory or a list of available circuits that can be used for trying a connection.

  Connection Manager retrieves outgoing and incoming call directory entry information from a file called SNAPHONE.CXM, where this information was stored at configuration time. The directory entries contain information such as the type of connection (asynchronous or synchronous for example) and the telephone number.

  So, the role of the Connection Manager is to control the establishment of calls through the network, based on configuration data, to route incoming calls to the appropriate applications and to terminate calls that are no longer required. It receives requests through the CMI API from the SNA subsystem.

- **Port Connection Managers**

  PCMs are the components which control individual ports. They have the responsibility of establishing, maintaining and terminating connections by controlling the physical adapter and the modem attached to these adapters.

  For example, PCMs initialize the modem and send the appropriate command strings for the modem to dial a telephone number. They receive their requests from the Connection Manager through an API called the Generalized Call Control Interface (GCCI), and they communicate with the MAC drivers through the Switched Connection Path Interface (SCPI).

- **Media Access Control (MAC) Drivers**

  MAC drivers are the physical OS/2 device drivers which control individual hardware ports. They are ANDIS (Advanced NDIS) MAC drivers; they communicate with the protocol stacks through the NDIS interface and with the PCMs through the SCPI interface. The combination of the NDIS and SCPI interfaces is called ANDIS (for Advanced NDIS).

  They keep the upper layers from having to know device specific interfaces by providing a low-level access to physical devices.

  Each MAC is designed for a particular device and cannot control any other.

  There are 3 MACs provided by SNA Phone Connect, as follows:

1. A COM Port MAC for asynchronous end-to-end connection via a COM port called COMMAC.SYS. (Its related configuration file is ADLCMAC.NIF)
2. An MPA MAC for synchronous end-to-end connection via MPA called MPADD.SYS. (Its related configuration file is MPADD.NIF).
3. An Autosync MAC for synchronous end-to-end via COM port called HAMMAC.SYS. (Its related configuration file is HAMMAC.NIF).

The above three MACs are *automatically* configured by CM/2 during the PCM configuration process and the CONFIG.SYS and PROTOCOL.INI files are updated accordingly.

There is a fourth MAC that can be used by SNA Phone Connect; it is the WAC MAC, necessary to support the WAC adapter. However, the difference is that the WAC MAC is *not supplied with CM/2*; it is supplied with the WAC adapter, and must therefore be installed and configured separately using the LAPS installation and configuration process.

The WAC MAC device driver is called *IBMWAC.OS2* and its related configuration file is *IBMWAC.NIF*. Note that these WAC files must be version 2.0 or above to work properly with SNA Phone Connect.

Important

Please note the distinction just made above about the WAC MAC, which is considered an OEM MAC. As mentioned above, CM/2 supplies three MACs *and automatically takes care of all the configuration requirements* for these three MACs (COMMAC, MPADD and HAMMAC).

CM/2 also supplies the capability for OEM MACs to be written to utilize the CM/2 SNA Phone Connect function; however, this *does not* mean that CM/2 supplies the required MACs nor automatically configures all the required elements for this OEM MAC. The WAC MAC is an example of an OEM MAC, which required the user to load the required MAC files and to configure LAPS.

1.5 Call Status Window

During the establishment of an outgoing call, SNA Phone Connect displays a small window on the desktop (called a Call Status window) to allow the user to monitor the progress of the call by displaying the interactive exchanges with the modem. This window appears whenever a switched connection over a modem or a CSU/DSU is initiated by your workstation and it disappears 10 seconds after a successful CONNECT.

The Call Status window remains on the desktop if the connection is not successfully connected.

No Call Status window is displayed for ISDN, leased line connections or switched incoming calls.

For ISDN, the ISBAMON utility can be used to monitor the establishment of the call and the interaction with the network. For details on how to use ISBAMON, please refer to *Communication Manager/2 Version 1.1 Enhancements, GG24-4142*.

Chapter 2. CM/2 SNA Phone Connect Configuration

This chapter describes the general concept behind configuring SNA Phone Connect. It explains the differences between the *quick* and *advanced* configuration process and reviews all the profiles involved. The objective is to give the new user a quick start on how to use the new profiles related to the SNA Phone Connect feature.

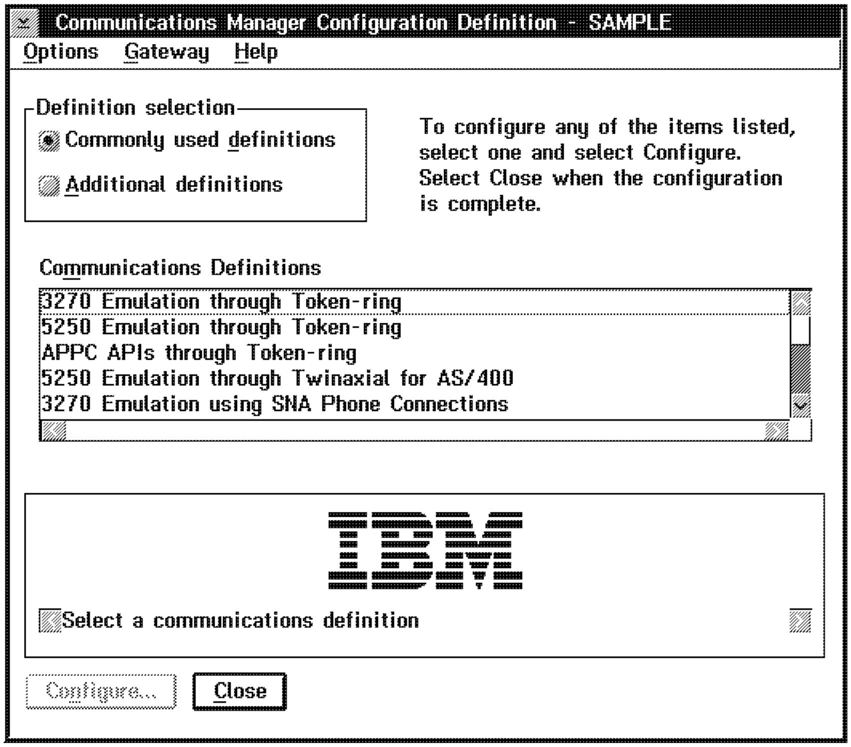
Specific configuration examples for specific scenarios will be illustrated later in subsequent chapters.

For any first time user

we highly recommend the use of the quick configuration process for SNA Phone Connect, whenever possible, in order to reduce the possibility of user configuration errors.

2.1 Selecting Commonly Used Definitions

Figure 5 is the new main configuration panel that you get, by default, with CM/2 V 1.11, and it lists *Commonly Used Definitions*.



Definition selection
● Commonly used definitions
○ Additional definitions

To configure any of the items listed, select one and select Configure. Select Close when the configuration is complete.

Communications Definitions
3270 Emulation through Token-ring
5250 Emulation through Token-ring
APPC APIs through Token-ring
5250 Emulation through Twinaxial for AS/400
3270 Emulation using SNA Phone Connections

Select a communications definition

Figure 5. New Main Configuration Window

All the "commonly used definitions" listed on the main configuration panel are supported by a quick configuration process. It is always recommended that novice users use the quick configuration process as a starting point, whenever available, because it is a much simpler process.

© Copyright IBM Corp. 1995

For example, the SNA Phone Connect quick configurations only use two windows. The drawback of the quick configuration process is that it uses many defaults which may or may not be applicable to your environment. However, you can always, at the end of the quick configuration process, branch into the advanced configuration process and change any of the values that were used during the quick configuration process. For that reason, we still recommend that novice users start by a quick configuration process, and then use the advance configuration process, if necessary, to modify those parameters that may not be acceptable for your environment.

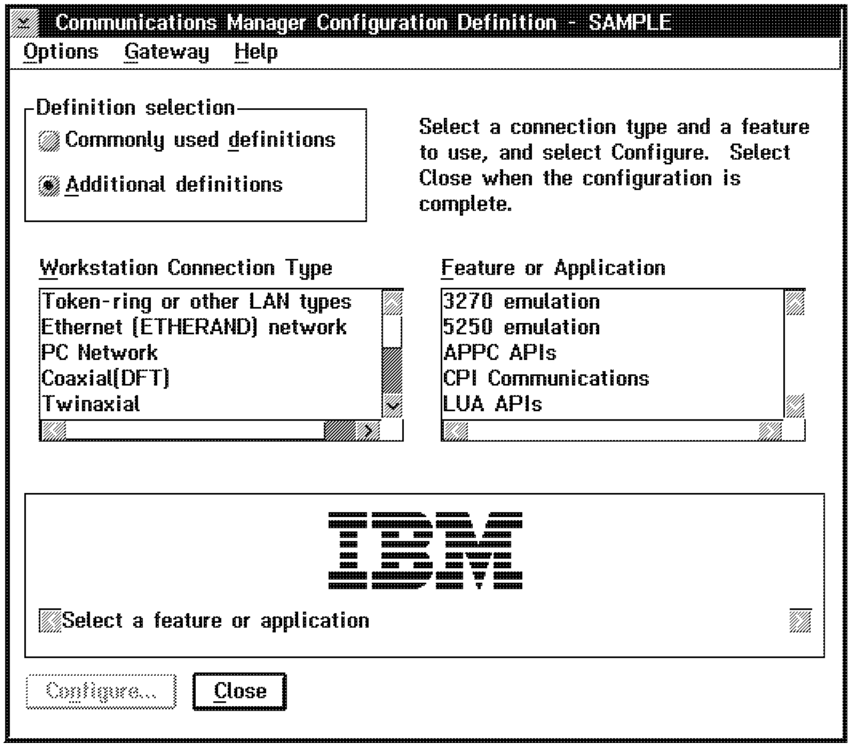
However some SNA Phone Connect configurations cannot be done through quick configuration, for example:

- To define connection to more than one system
- To accept incoming calls from other workstations
- To change default values, such as the COM port used, the speed, etc.
- To configure only for APPC applications

In this case, the recommended method is to start from a quick configuration path which contains the base of what you need, enter most of the required data into the quick configuration windows, and then branch into the advanced configuration process to modify or add the elements that are not part of the quick configuration process.

2.2 Selecting Additional Definitions

If you prefer the main definition panel that you had with the previous release of CM/2, you can simply select the radio button identified as **Additional Definitions**, and you will get the panel as shown in Figure 6.


Communications Manager Configuration Definition - SAMPLE
Options
Gateway
Help
Definition selection
Workstation Connection Type
Feature or Application
Configure...
Close

○ Commonly used definitions
● Additional definitions

Select a connection type and a feature to use, and select Configure. Select Close when the configuration is complete.

Workstation Connection Type:
Token-ring or other LAN types
Ethernet (ETHERAND) network
PC Network
Coaxial(DFT)
Twinaxial

Feature or Application:
3270 emulation
5250 emulation
APPC APIs
CPI Communications
LUA APIs

Select a feature or application

Figure 6. Main Configuration Window from Previous Release

If this is your first time configuring CM/2 you should use the quick configuration windows whenever possible, such as 3270 emulation or 5250 emulation, and then continue to advanced configuration if the quick configuration process does not meet all your needs.

The advanced configuration window will be described later on in this chapter.

Note

The definition selection that you made, that is **Commonly used definition** or **Additional definition**, will be saved along with your configuration. Therefore the same definition selection panel will be presented when you next start the configuration process again.

In other words, once you have used the advanced configuration from the **Additional definition**, you will always get back to the advanced configuration when you start configuration.

There are a few rules to remember about the quick configuration process for SNA Phone Connect:

- You will not be allowed into the quick configuration process if:
  - There is already more than one PCM (modem) configured.
  - There is more than one port configured for the modem.
  - You want to use X.25 or IDLC.
- The quick configuration only supports one modem; if you have an IBM 5853 modem configured, and you change it to an IBM 7855, then the configured IBM 5853 modem will be deleted and replaced by the IBM 7855.
- There is only one outgoing call directory entry automatically created. The entry name will default to your configuration name followed by _1; for example, MYCONFIG_1.
- When entering the configuration process, if the Modem connection field is pre-filled, it is because a modem has already been configured.

2.3 Quick Configuration

Following are two examples of using the quick configuration process:

1. The first example is for configuring 3270 emulation using a synchronous switched SNA Phone connection, which uses only two configuration panels, the first of which is Figure 7 on page 14.

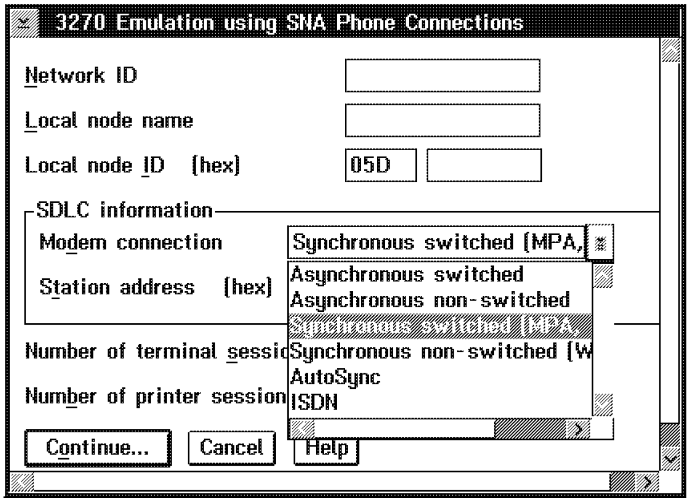

3270 Emulation using SNA Phone Connections
Network ID
Local node name
Local node ID (hex)
05D
SDLC information
Modem connection
Synchronous switched (MPA,
Station address (hex)
Asynchronous switched
Asynchronous non-switched
Synchronous switched (MPA,
Synchronous non-switched (W
AutoSync
ISDN
Number of terminal sessio
Number of printer session
Continue...
Cancel
Help

Figure 7. CM/2 First Window of Quick Configuration

a. **Network ID**

   This is the name of the network to which this node belongs. Usually each organization will have a naming convention needs to be followed.

b. **Local node name**

   This is the CP name of this node.

c. **Local node ID**

   This value defaults to 00000. It is usually the IDBLK/IDNUM on the host NCP configuration.

d. **Modem connection**

   There are six possible connections in the list box supported by SNA Phone Connect. Select one connection for 3270 emulation from the list box, for example, Synchronous switched (MPA,WAC,OEM).

   The connection that you select above will determine the Modem Definitions listings in the second window.

e. **Station address**

   This value defaults to 01. This value is not important in the switched connection environment.

Note

Before using a synchronous modem with CM/2, configure the modem for synchronous operation. Most modems have front panel or dip switches for configuration. Refer to the modem user′s guide for information on how it is configured.

Figure 8 on page 15 shows the second configuration panel for quick configuration of 3270 emulation using a synchronous switched circuit. The entries listed here under Modem Definitions vary depending on the modem connection type chosen on the previous panel.

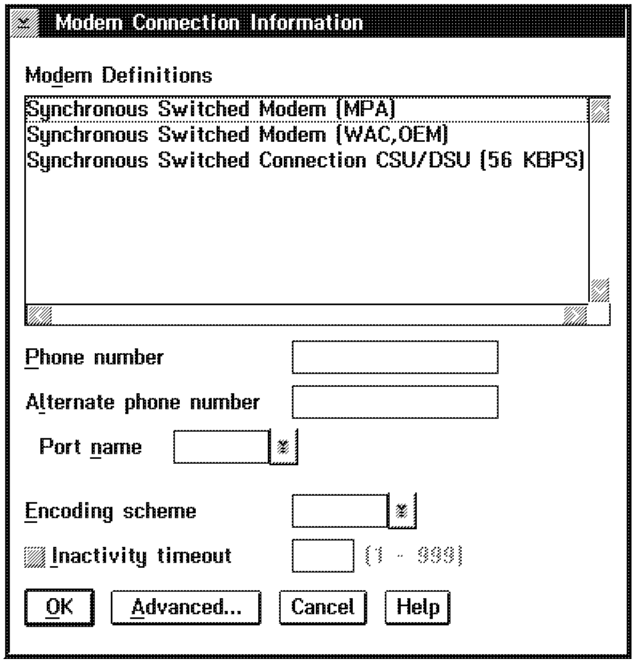
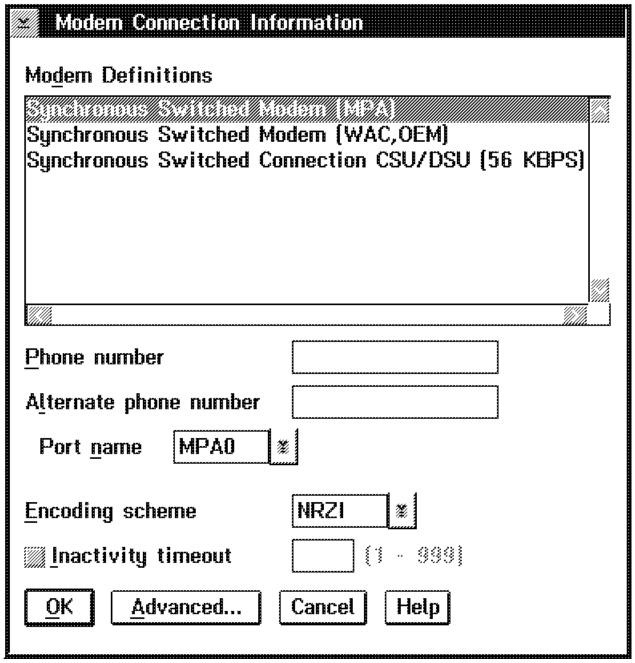

Modem Connection Information
Modem Definitions
Synchronous Switched Modem (MPA)
Synchronous Switched Modem (WAC,OEM)
Synchronous Switched Connection CSU/DSU (56 KBPS)
Phone number
Alternate phone number
Port name
Encoding scheme
Inactivity timeout
(1 - 999)
OK
Advanced...
Cancel
Help

Figure 8. CM/2 Second Window of Quick Configuration

a. **Modem Definitions**

Select one modem from the list. In this case you only have three choices for the synchronous switched connection depending on your adapter. Select Synchronous Switched Modem (MPA) if you are using an IBM MPA card. Once you select a modem definition selection, the pre-filled default values for **Port name** and **Encoding scheme** will be displayed as shown in Figure 9:

Note: These values get pre-filled only with CM/2 supplied MACs.



Modem Definitions: Synchronous Switched Modem (MPA)

Port name: MPA0

Encoding scheme: NRZI

Modem Connection Information
Synchronous Switched Modem (WAC,OEM)
Synchronous Switched Connection CSU/DSU (56 KBPS)
Phone number
Alternate phone number
Inactivity timeout
(1 - 999)
OK
Advanced...
Cancel
Help

Figure 9. Pre-filled Port Name and Encoding Scheme

   You may alter these fields if required; however, it is recommended to use default values for CM/2 MACs.

   b. **Phone number**

      This is a telephone number to be auto-dialed when you activate the connection. It is the number of the remote system that you are calling and it only appears for switched connections.

   c. **Alternate phone number**

      This is the number to be dialed when the first phone number is busy. It is an optional parameter and applies only to switched connections.

   d. **Port name**

      This defaults to MPA0 for using one MPA adapter only. This parameter only applies to switched connections as well.

   e. **Encoding scheme**

      This defaults to NRZI for this type of connection, or you may select one from the list box. The value that you choose has to be the same as defined in the host NCP configuration. This parameter is applicable to switched and autosync connections.

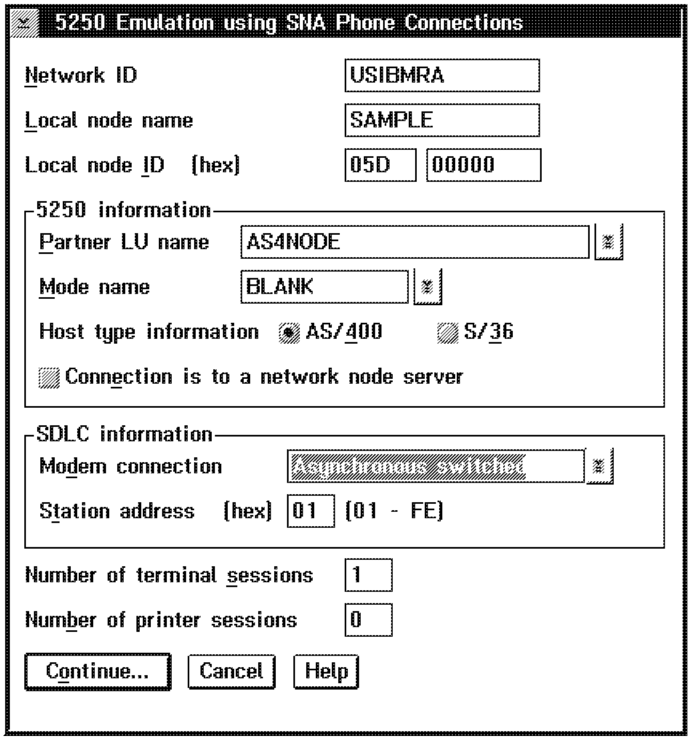
   f. **Inactivity timeout**

      If selected, enter the amount of time after which the link should be disconnected automatically by CM/2 when there is no data traffic on the link.

   When you have completed these two configuration panels, you can exit the configuration process; the file will be verified and you will likely need to reboot if this is the first time you are configuring SNA Phone Connect (since CONFIG.SYS and PROTOCOL.INI need to be updated); in any case, CM/2 will tell the user when a re-boot is required.

   If you need to modify some of the parameters that have been chosen by default during the quick configuration process, you can use the advanced configuration process. To do so, select **Advanced...** on the second quick configuration window. Refer to 2.4, “Advanced Configuration” on page 19.

2. The second example is for configuring 5250 emulation to an AS/400 using an asynchronous switched SNA Phone Connection. This also requires two configuration panels, the first of which is shown below:



Network ID: USIBMRA

Local node name: SAMPLE

Local node ID (hex): 05D 00000

5250 information

Partner LU name: AS4NODE

Mode name: BLANK

Host type information: ● AS/400 ○ S/36

☐ Connection is to a network node server

SDLC information

Modem connection: Asynchronous switched

Station address (hex): 01 (01 - FE)

Number of terminal sessions: 1

Number of printer sessions: 0

Figure 10. CM/2 First Window of Quick Configuration

a. **Network ID**

   This is the name of the network to which this node belongs. Usually each organization will have a naming convention that needs to be followed. This name should be match the AS/400 controller definition as well.

b. **Local node name**

   This is the CP name of this node. This name should match the AS/400 controller definition as well.

c. **Local Node ID**

   This value defaults to 00000. It is not important for asynchronous switched connection to AS/400, as this node is configured as a *secondary* link station.

d. **Partner LU name**

   This is the key for this connection. It is the name of the AS/400.

e. **Mode name**

   Can use any mode which supports interactive sessions.

f. **Modem connection**

   Select one connection from the list box, for example, Asynchronous switched, which is applicable to your connection type. There are six possible choices here, such as:

   - Asynchronous switched
   - Asynchronous non-switched
   - Synchronous switched

- Synchronous non-switched
- Autosync
- ISDN

The connection that you select above will determine the types of modems which will be listed in the second configuration window.

g. **Station address**

This value defaults to 01. It is not important in a switched connection.

The second window of the quick configuration process for 5250 emulation is shown below. The list of modem definitions may vary dependent on the modem connection type selected on the previous panel.

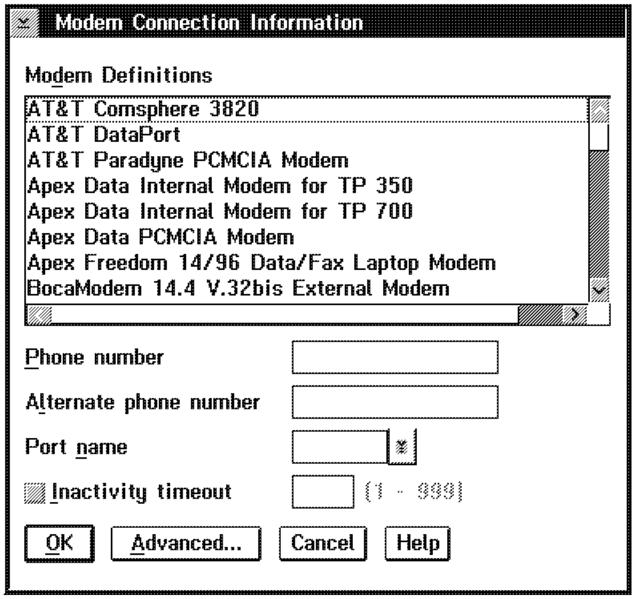

Modem Connection Information
Modem Definitions
AT&T Comsphere 3820
AT&T DataPort
AT&T Paradyne PCMCIA Modem
Apex Data Internal Modem for TP 350
Apex Data Internal Modem for TP 700
Apex Data PCMCIA Modem
Apex Freedom 14/96 Data/Fax Laptop Modem
BocaModem 14.4 V.32bis External Modem
Phone number
Alternate phone number
Port name
Inactivity timeout
(1 - 999)
OK
Advanced...
Cancel
Help

Figure 11. CM/2 Second Window of Quick Configuration

a. **Modem Definitions**

Select one modem from the list. If your modem is not in the list, there is a generic definition that can be used by selecting a **User-Defined Asynchronous Switched Connection Modem** at the end of the list. For this example, we selected the IBM 7855 modem.

Your modem definition selection here will determine the default Port name, that is COM1. You may alter the port name if required. These pre-filled values are entered only for CM/2 supplied MACs.

b. **Phone number**

This is a telephone number to be auto-dialed when you activate the connection. It is the number of the remote system that you are calling. This applies only to switched connections.

c. **Alternate phone number**

This is the number to be dialed when the first phone number is busy. This is an optional parameter and it applies only to switched connections.

d. **Port name**

This defaults to COM1 for using one serial port only. You may alter the value from COM1 up to COM8. However make sure that you use COM1 for serial 1, COM2 for serial 2, and so on. This parameter applies only to switched connections.

Also make sure that the serial ports are configured accordingly. Use the reference diskette to configure the serial ports.

Note

When configuring a ThinkPad with a PCMCIA adapter card, COM2 is usually the port used by default since the connection is direct from the PCMCIA card to the telephone line. Do not specify COM1 in this case, unless you have disabled the serial port at the back of the ThinkPad. Also make sure that the CONFIG.SYS has an entry for the PCMCIA device driver with the right COM port number and slot number, that is as it is physically configured.

Make sure that all device drivers used by SNA Phone Connect are in the right order in CONFIG.SYS.

e. **Inactivity timeout**

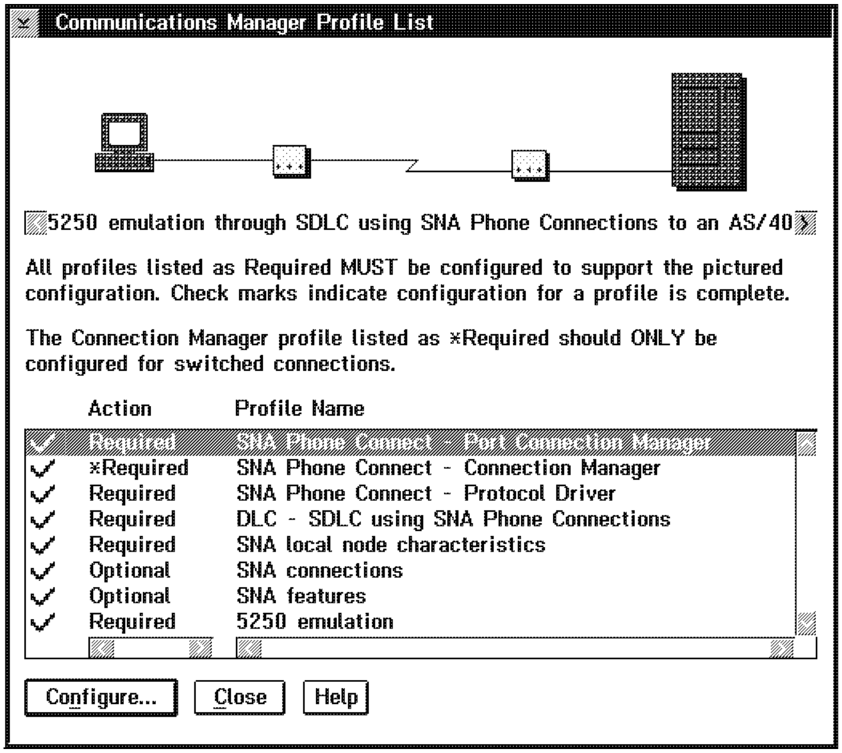
If selected, enter the amount of time after which the link should be disconnected automatically by CM/2 when there is no data traffic on the link.

When you have completed these two configuration windows, you can exit the configuration process,and the file will be verified. You will likely need to reboot if this is the first time you are configuring SNA Phone Connect (since CONFIG.SYS and PROTOCOL.INI need to be updated).

If you need to modify some of the parameters that have been chosen by default during the quick configuration process, you can use the advanced configuration process. To do so, select **Advanced...** on the second quick configuration window. Refer to 2.4, “Advanced Configuration.”

2.4 Advanced Configuration

If you use the Advanced Configuration process, the window below is the first that will be shown; it lists all the profiles which need to be configured for the particular connection and application that you have chosen to configure.



5250 emulation through SDLC using SNA Phone Connections to an AS/40

All profiles listed as Required MUST be configured to support the pictured configuration. Check marks indicate configuration for a profile is complete.

The Connection Manager profile listed as *Required should ONLY be configured for switched connections.

	Action	Profile Name
✓	Required	SNA Phone Connect - Port Connection Manager
✓	*Required	SNA Phone Connect - Connection Manager
✓	Required	SNA Phone Connect - Protocol Driver
✓	Required	DLC - SDLC using SNA Phone Connections
✓	Required	SNA local node characteristics
✓	Optional	SNA connections
✓	Optional	SNA features
✓	Required	5250 emulation

Figure 12. CM/2 Advanced Configuration Window

The first three profiles in the list are specific to SNA Phone Connect, namely:

1. SNA Phone Connect - Port Connection Manager
2. SNA Phone Connect - Connection Manager
3. SNA Phone Connect - Protocol Driver

There is also a new profile called “DLC - SDLC using SNA Phone Connections” The content of this profile is similar to the traditional SDLC DLC profile except for two parameters:

- The logical adapter number (or virtual port) is automatically configured starting at 2 (instead of 0)
- A new parameter called **Incoming Call Directory** allows you to specify which incoming calls should be accepted by this DLC. Refer to 2.4.5, “DLC - SDLC Using SNA Phone Connection” on page 34.

2.4.1 SNA Phone Connect - Port Connection Manager

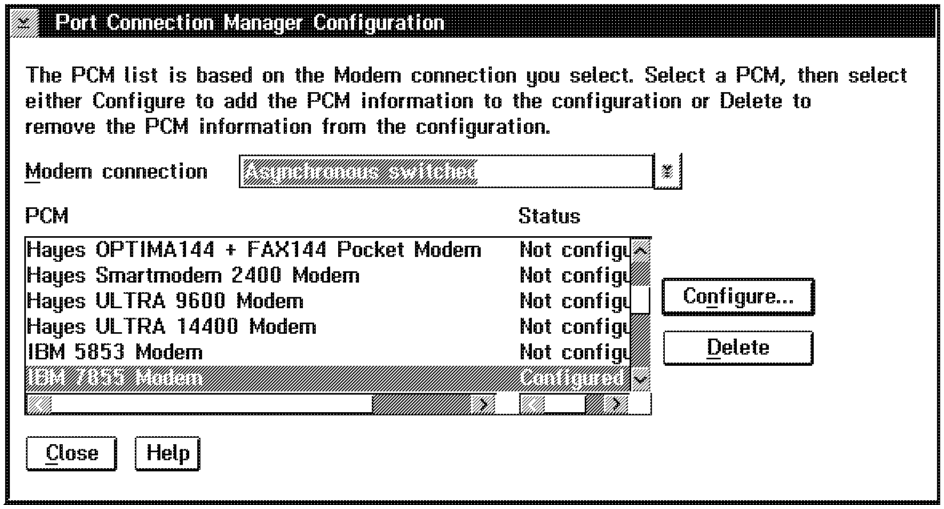
A Port Connection Manager (PCM) is the component that manages and controls connectivity, through the use of a MAC device driver and an adapter, along with the modem that is attached to the adapter/port.

From the PCM configuration window shown below you can change the **Modem connection** from the list box. As previously explained, there are six possible connections supported by SNA Phone Connect. The modem connection that you select will determine the PCM types that will get listed. It will also determine the default value for PCM configuration (that is, the modem parameters) in the next window as shown in Figure 14 on page 22.

The PCM list is built by reading the NETWORK.INI file, which contains all possible PCMs. For each PCM in NETWORK.INI, the corresponding PIF file is opened to obtain the type of modem. The PCM is displayed as a selectable entry if its modem type matches the modem connection you have selected. This is to reduce the possible number of PCM entries displayed and speed up your PCM selection.

Here you can see the sample PCM configuration from the second example of quick configuration (see page18).

Asynchronous switched is the connection type with the greatest number of possible PCMs, as CM/2 supports more than 100 different types of modems.



The PCM list is based on the Modem connection you select. Select a PCM, then select either Configure to add the PCM information to the configuration or Delete to remove the PCM information from the configuration.

Modem connection: Asynchronous switched

PCM	Status
Hayes OPTIMA144 + FAX144 Pocket Modem	Not configu
Hayes Smartmodem 2400 Modem	Not configu
Hayes ULTRA 9600 Modem	Not configu
Hayes ULTRA 14400 Modem	Not configu
IBM 5853 Modem	Not configu
IBM 7855 Modem	Configured

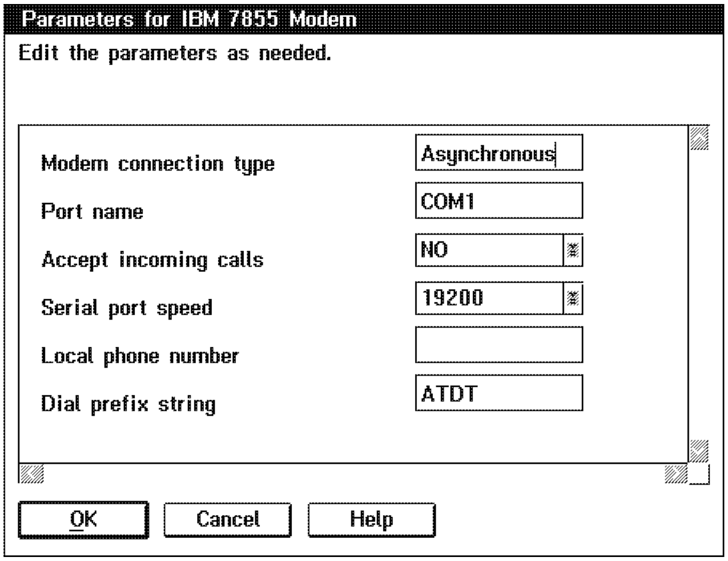
Figure 13. PCM Configuration Window

The selected modem can be configured from the window shown in Figure 14 on page 22 by selecting **Configure...**. The parameters to be displayed on this panel, along with the default values which are pre-filled in some of the fields are determined by the contents of the PIF file for this modem, in this case IBM7855.PIF, or by the contents of the already configured PCM entry in the PROTOCOL.INI file in cases where this specific PCM has been configured already.

Note

The PIF files are considered internal files and should NEVER be modified by the user. If PIF files have been modified, and the user calls IBM for service, he will be asked to re-install CM before proceeding. If you need to change a value, then change it in the PCM configuration profile and that value will be saved in PROTOCOL.INI.

When you select **OK** from this window and complete the configuration, the values you have entered will be saved in the appropriate PCM entry in the PROTOCOL.INI file.


Parameters for IBM 7855 Modem

Edit the parameters as needed.

Modem connection type: Asynchronous

Port name: COM1

Accept incoming calls: NO

Serial port speed: 19200

Local phone number:

Dial prefix string: ATDT

Figure 14. IBM 7855 Modem Parameters

- **Modem connection type**

  This is pre-filled from the selection in the previous window. You cannot change this field from this window. To change the modem connection type you have to go back to the PCM window, that is Figure 13 on page 21.

- **Port name**

  This identifies the specific hardware port to use, for example:

  - For an asynchronous connection, as in this example, COM1 to COM8 can be used.
  - For an autosync connection, COM1 to COM8 again can be used.
  - For a synchronous connection with MPA, MPA0 to MPA1 can be used.
  - For a synchronous connection with a WAC adapter, any name can be used as long as it matches the name used when configuring LAPS for a WAC adapter. Refer to 2.5, “LAPS Configuration for WAC Adapter” on page 37.

  For COM port and WAC adapter, a maximum of 2 ports can be configured. To configure 2 ports in PCM (that is, for one PCM to manage multiple adapters), enter the port names separated with a comma (for example COM1,COM2).

- **Accept incoming calls**

  The default is NO if no incoming call. Otherwise select **YES** from the list box. Do not forget to create an incoming call directory entry from the Connection Manager profile and specify the incoming directory entry in the DLC - SDLC for SNA Phone Connect to receive incoming calls (refer to 2.4.5, “DLC - SDLC Using SNA Phone Connection” on page 34).

- **Serial port speed**

  Using the default value for speed is recommended. In this example, the maximum speed is 57.6 Kbps. This serial port speed is called *DTE speed* as well. Depending on the modem used, there are 2 options for line speed:

  1. The actual speed used for data transfer will be the line speed as configured in the modem.

2. the actual speed used for data transfer will be the speed specified as DTE speed, which will be passed to the modem. That is, some modems allow the use of pin 23 to allow the DTE to specify the speed that is to be used.

For example, with an IBM 7855 modem, say you choose to use the DTE speed from the second option above, and the DTE speed is passed to the modem, as 19.2 Kbps; since this modem can only support 12 Kbps, the line speed will then be set to 12 Kbps, while the DTE speed stays at 19.2 Kbps as per the default value.

- **Local phone number**

  This is an optional parameter. It is only required if an incoming call directory entry is required, and it must match the called party number defined in the incoming call directory entry. Refer to page 31 for configuring *Called party number*.

- **Dial prefix string**

  ATDT indicating that you are using dial tones to dial. If you were using Pulse Code Modulation instead, you would specify ATDP.

When you select **OK** from this window and complete the PCM configuration, the following happens:

- PROTOCOL.INI is updated with a PCM entry for the modem.
- NETWORK.INI is also updated if this is your first time configuring this PCM; that is, the AUTOSTART parameter for this PCM will be changed to YES so that CM/2 will start this PCM when CMSTART is performed.
- The corresponding MAC section is added to the PROTOCOL.INI (for a CM/2 supplied MAC only) if this is your first time configuring a new connection type or your first time configuring a new port name. The MAC section is updated using the default values from the NIF file, but the port name and PCMCIA parameters will be overwritten using the PCM definition value.
- CONFIG.SYS is updated as well (for CM/2 supplied MACs only) if this is your first time configuring this type of connection, that is if you′re adding a MAC device driver. Therefore you will be told by CM/2 to reboot the system.
- Protocol driver information is added to PROTOCOL.INI if this is your first time configuring SNA Phone Connect (for CM/2 supplied MACs only).

As previously mentioned, there are six different modem connection types to choose from, that is:

- Asynchronous switched
- Asynchronous non-switched
- Synchronous switched
- Synchronous non-switched
- Autosync
- ISDN

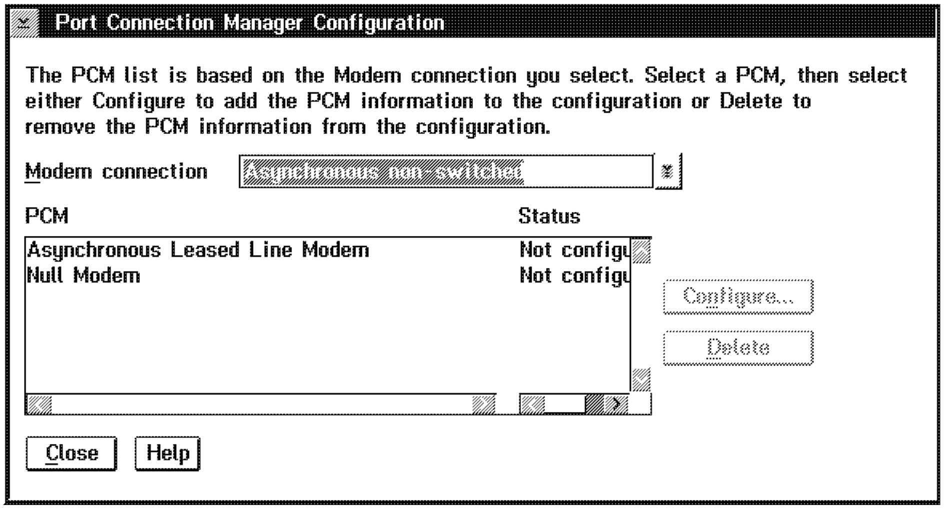
and each one of these connection types, when selected, will display a list of PCMs which can be configured for this particular connection type.

We have shown below the window which is displayed for each of these six possible connection types:

1. Asynchronous switched connection

As shown in Figure 13 on page 21.

2. Asynchronous non-switched connection



Port Connection Manager Configuration

The PCM list is based on the Modem connection you select. Select a PCM, then select either Configure to add the PCM information to the configuration or Delete to remove the PCM information from the configuration.

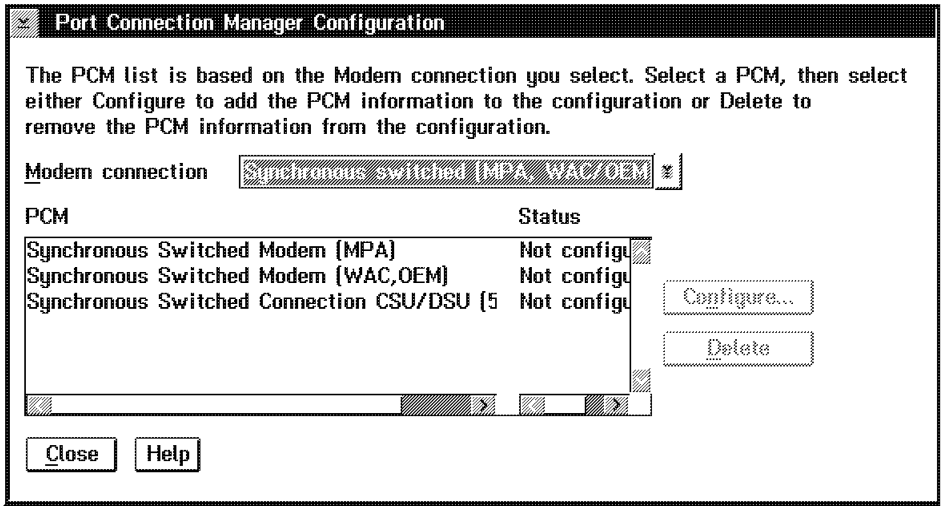
Modem connection: Asynchronous non-switched

PCM	Status
Asynchronous Leased Line Modem	Not configu
Null Modem	Not configu

Figure 15. PCM Selection for Asynchronous Non-Switched

In this case, you are using either a leased line which gives you a permanent connection, or you are using a null modem (connecting two PCs back to back with a real network in between).

3. Synchronous switched connection



Port Connection Manager Configuration

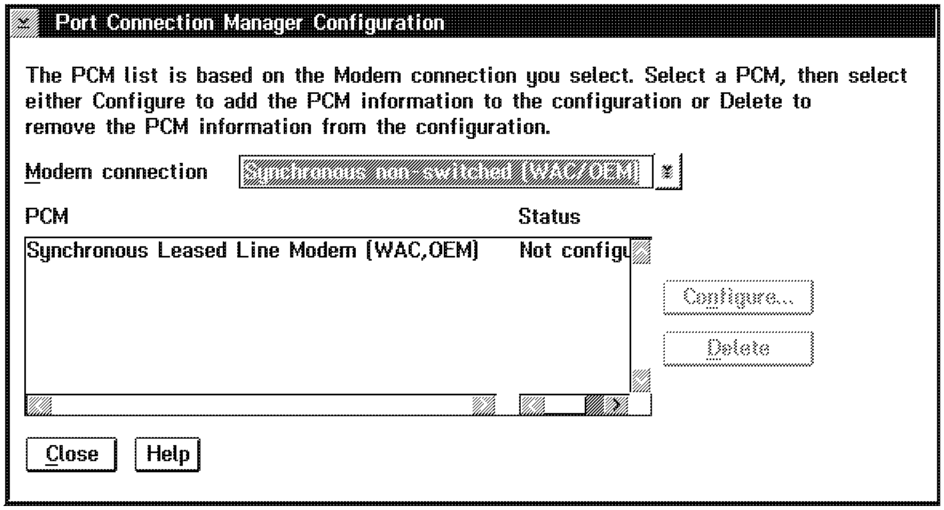
The PCM list is based on the Modem connection you select. Select a PCM, then select either Configure to add the PCM information to the configuration or Delete to remove the PCM information from the configuration.

Modem connection: Synchronous switched (MPA, WAC/OEM

PCM	Status
Synchronous Switched Modem (MPA)	Not configu
Synchronous Switched Modem (WAC,OEM)	Not configu
Synchronous Switched Connection CSU/DSU (5	Not configu

Figure 16. PCM Selection for Synchronous Switched

4. Synchronous non-switched connection



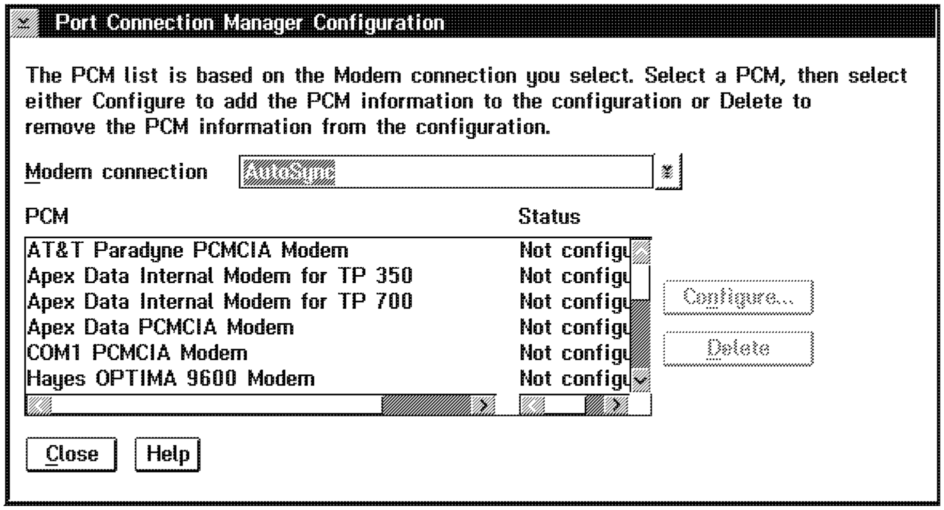
The PCM list is based on the Modem connection you select. Select a PCM, then select either Configure to add the PCM information to the configuration or Delete to remove the PCM information from the configuration.

Modem connection: Synchronous non-switched (WAC/OEM)

PCM	Status
Synchronous Leased Line Modem (WAC,OEM)	Not configu

Figure 17. PCM Selection for Synchronous Non-Switched

5. AutoSync connection



The PCM list is based on the Modem connection you select. Select a PCM, then select either Configure to add the PCM information to the configuration or Delete to remove the PCM information from the configuration.

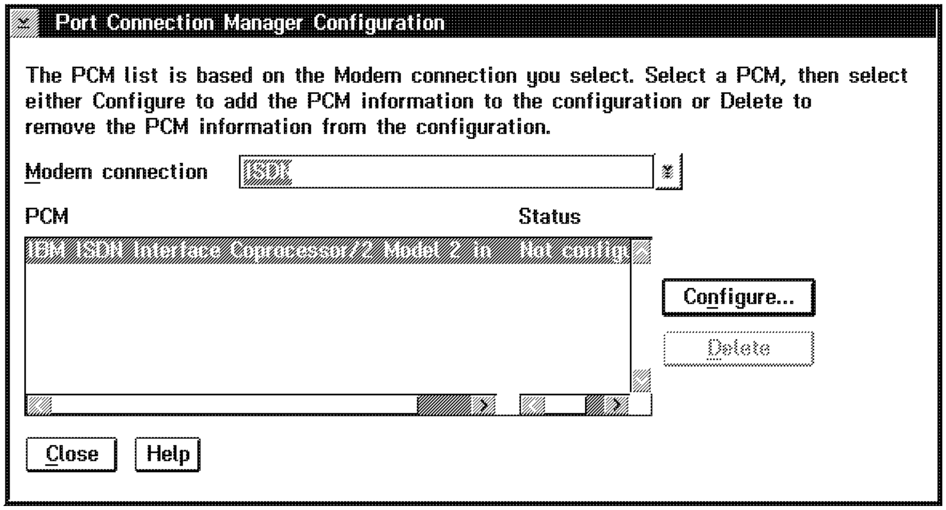
Modem connection: AutoSync

PCM	Status
AT&T Paradyne PCMCIA Modem	Not configu
Apex Data Internal Modem for TP 350	Not configu
Apex Data Internal Modem for TP 700	Not configu
Apex Data PCMCIA Modem	Not configu
COM1 PCMCIA Modem	Not configu
Hayes OPTIMA 9600 Modem	Not configu

Figure 18. PCM Selection for AutoSync

This lists a dozen or so Autosync modems that have been pre-configured.

6. ISDN



Port Connection Manager Configuration

The PCM list is based on the Modem connection you select. Select a PCM, then select either Configure to add the PCM information to the configuration or Delete to remove the PCM information from the configuration.

Modem connection: ISDN

PCM	Status
IBM ISDN Interface Coprocessor/2 Model 2 in	Not config

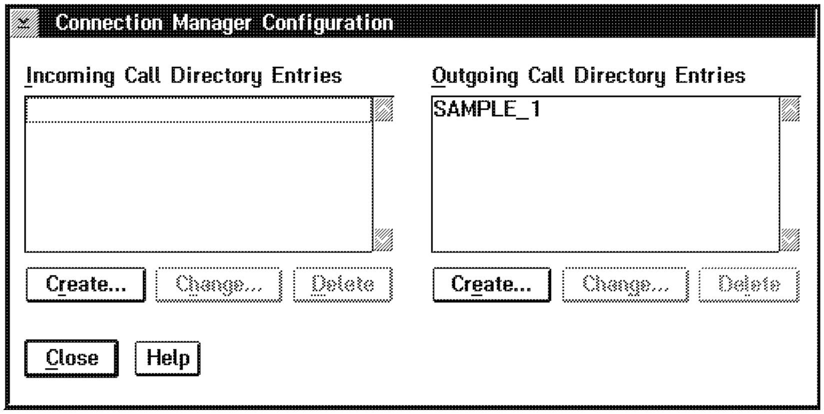
Figure 19. PCM Selection for ISDN

In this case, you will get an entry listed for each ISDN Coprocessor card installed in your machine.

2.4.2 SNA Phone Connect - Connection Manager

Connection Manager is the component that maintains a directory, similar to a telephone book, of all the potential destinations you might want to reach. Each entry contains a telephone number as well as the type of connection (async, sync, autosync). The Connection Manager also manages all defined PCMs, which it uses to place and receive calls.

Figure 20 shows the Connection Manager configuration window:



Connection Manager Configuration

Incoming Call Directory Entries

Outgoing Call Directory Entries: SAMPLE_1

Figure 20. Connection Manager Window

From this window you can create:

1. Incoming call directory entries, required to accept incoming calls
2. Outgoing call directory entries, required to place outgoing calls

For non-switched (permanent) connection, this profile is not required. Instead, a permanent connection name is supplied when configuring the logical link definition on the Connections profile, and this name must match the permanent connection name that was supplied when configuring the PCM.

If you used quick configuration to configure SNA Phone Connect, one outgoing call directory entry was automatically created with the same name as the configuration file name followed by _1 (underscore and the digit one). For example, the entry shown in the figure above is named SAMPLE_1, indicating that this entry was created while the user was using the quick configuration process for a configuration named SAMPLE.

The entries thus created are stored in a file called SNAPHONE.CXM. It is a binary file and therefore cannot be changed with your favorite editor. However, there is a small utility called CMTELNUM which allows you to change the telephone numbers associated with these directory entries.

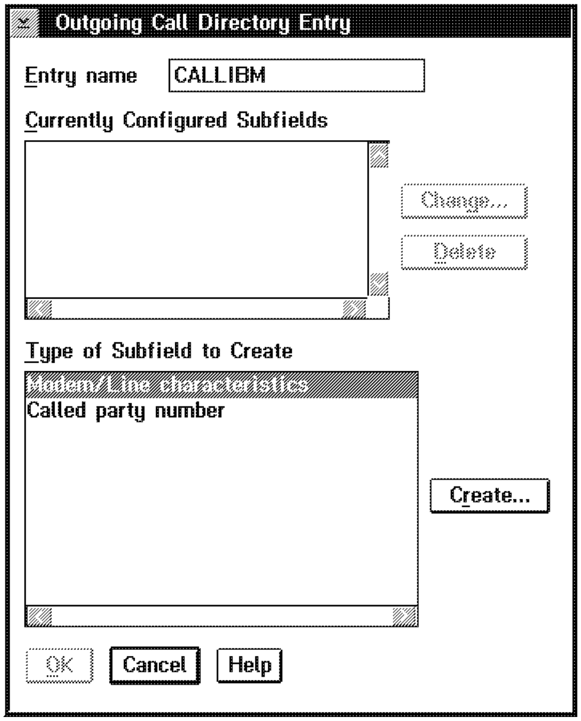
To create an outgoing call directory entry, select **Create...** under the Outgoing Call Directory Entries list box, or you may want to change an existing outgoing directory entry by first selecting the entry and then selecting **Change...**.

Following is an example of creating an outgoing call directory entry. When selecting **Create...** the user normally gets the outgoing call directory entry window displayed, as shown in Figure 21.

Note

If ISDN is also installed on the workstation, the user first gets a small window asking him to identify whether the entry is being created for an ISDN network or for an analog network.

The user does not get get this window if ISDN is not installed on the workstation. This also applies when creating an incoming call directory entry.



Entry name: CALLIBM

Currently Configured Subfields

Type of Subfield to Create

- Modem/Line characteristics
- Called party number

Figure 21. Outgoing Call Directory Entry

Enter the name that you have chosen to call this particular entry, (for example **CALLIBM** as we have used here). Then configure the **modem/line characteristic** and the **called party number** by selecting one of the entries in the bottom list (labeled ′type of subfield to create′), and clicking on Create.

For example, after selecting **Modem/Line characteristics**, the panel shown in Figure 22 is displayed.

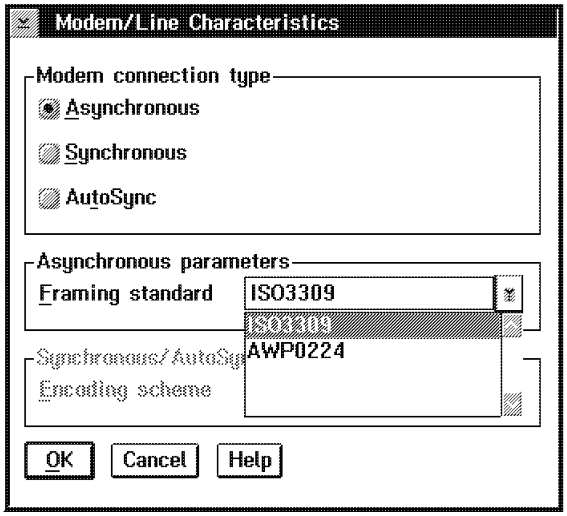


Figure 22. Modem/Line Characteristics

- **Modem connection type**

  There are 3 possible choices for the connection type, as shown here:

  - **Asynchronous**

    Use for asynchronous connection only. When you select this particular connection type, the asynchronous parameters entry labeled *Framing Standard* right below the connection type entry will become selectable (from a greyed out stage). The framing standard can then be specified as **AWP0224** or **ISO3309**.

    Use AWP0224 for connection to an AS/400 or to the Advantis network, and use ISO3309 for connection to other OS/2 and other systems.

    Note

    CM/2 uses the ISO3309 framing standard by default. When you create an Outgoing call directory entry for a switched asynchronous connection, you can change the framing standard to AWP0224, which is required when that connection is to an AS/400.

    For a permanent (leased) connection however, you do not configure an outgoing call directory entry, but use a permanent connection name instead. Since you cannot, on a leased line, change the framing standard from ISO3309 to AWP0224, you cannot therefore use an async leased line to go to an AS/400.

    In other words, a leased or null modem connection to an AS/400 is not supported.

  - **Synchronous and/or AutoSync**

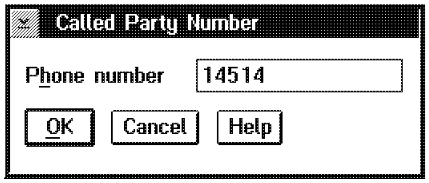
Use for synchronous or AutoSync connections. When you select this particular connection type, the synchronous/AutoSync parameters entry labeled Encoding Scheme right below the asynchronous parameters will become selectable (from a greyed out stage). The encoding scheme can then be specified as Use default, NRZI or NRZ.

You would normally let this parameter default to Use default, which means to use the value for Encoding Scheme that was specified in the Port Connection Manager profile.

If a value other than Use default is specified (such as NRZI or NRZ), then this value will override the one specified in the Port Connection Manager profile.

NRZI is usually considered a better encoding scheme than NRZ to avoid loss of clock synchronization between modems for extended sequences of zero-bits data.

When you select the **Called party number** you can enter the telephone number of the remote system that you are calling as shown in Figure 23.

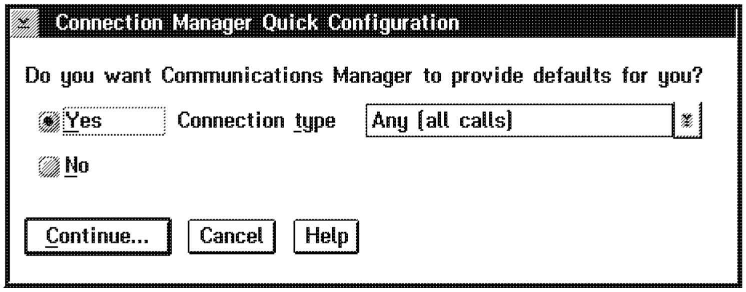


Phone number 14514

Figure 23. Called Party Number

Multiple telephone numbers can be entered simply by separating each telephone number from the next one by a comma. The first number becomes the primary number, and the others are alternate numbers.

Here is an example of creating an incoming call directory. When you select **Create...** under the Incoming Call Directory Entries list box, the window shown in Figure 24 is displayed.



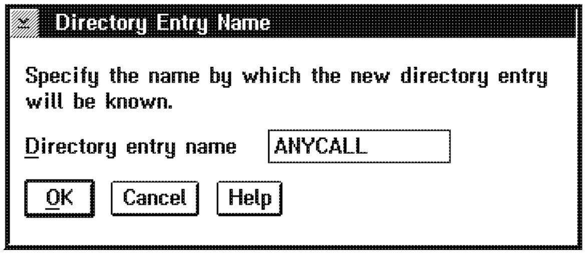
Do you want Communications Manager to provide defaults for you?

● Yes Connection type Any (all calls)

○ No

Figure 24. Creating Incoming Call Directory Entry Window

Select **Yes** to use default values provided by CM/2 if you want to accept any call, and then select **Continue...**; the window shown in Figure 25 on page 30 will be displayed where you can enter the name that you have chosen to call this entry (in this case, we have chosen the name ANYCALL).



Directory Entry Name

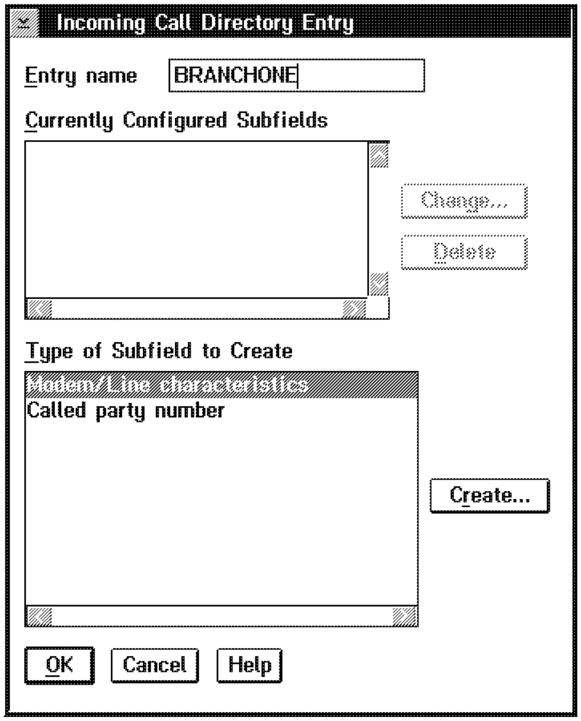
Specify the name by which the new directory entry will be known.

Directory entry name: ANYCALL

Figure 25. Incoming Call Directory Entry Name

This is all you have to do to create a directory entry with default values, and this entry will be valid to accept any type of incoming call.

To create an incoming call directory entry with your own specifications (that is where you want to choose a specific synchronicity for example), select **NO** in Figure 24 on page 29. In this case, the next panel displayed will be as shown in Figure 26.



Incoming Call Directory Entry

Entry name: BRANCHONE

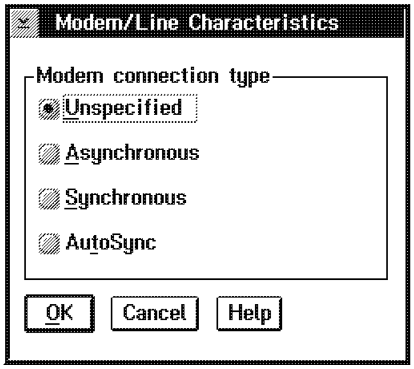
Currently Configured Subfields

Type of Subfield to Create
- Modem/Line characteristics
- Called party number

Figure 26. Incoming Call Directory Entry

Enter the name you have chosen to call this entry that you are creating (for example, “BRANCHONE” as displayed above in our example):

Then select the entry **Modem/Line characteristic** under the heading “Type of Subfield to Create,” and click on **Create**, which displays the following panel:



Modem/Line Characteristics

Modem connection type

● Unspecified

○ Asynchronous

○ Synchronous

○ AutoSync

Figure 27. Unspecified Modem/Line Characteristic

Here you can select the specific type of synchronicity that you want to use for this connection. Selecting **Unspecified** here would be the equivalent of choosing defaults, that is, you will accept any type of synchronicity.

You do not have to configure a **Called party number**, If you do however, then the number entered here must match the local phone number for this connection in the PCM configuration, as illustrated with the phone number 88888 below:

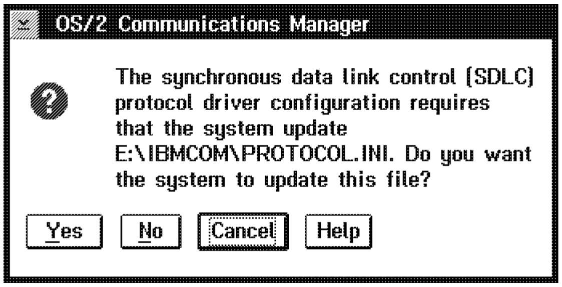
```
PCM Configuration Window

       Parameters for IBM 7855 Modem

       Edit the parameters as needed.


        Modem connection type  : Asynchronous
        Port name              : COM1
        Accept incoming calls  : YES
        Serial port speed      : 19200
        Local phone number     : 88888
        Dial prefix string     : ATDT


           OK        Cancel        Help              NOTE:
                                                     These two
                                                     numbers
                                                     should
                                                     match.
Connection Manager Window for Incoming Call        }       «

       Called Party Number

       Phone number  : 88888


          OK     Cancel     Help
```

Figure 28. PCM and CM Local Phone Number Definition

Once an incoming call directory entry is created, its entry name is the value that will be specified in the DLC - SDLC for SNA Phone Connect profile.

2.4.3 SNA Phone Connect - Protocol Driver

If ISDN or X.25 is not installed in the machine, then the only protocol driver requiring configuration is the SDLC protocol driver, and the panel below is the only panel displayed when opening the Protocol Driver Profile:



The synchronous data link control (SDLC) protocol driver configuration requires that the system update E:\IBMCOM\PROTOCOL.INI. Do you want the system to update this file?

Figure 29. To Update PROTOCOL.INI

As a result of clicking on YES, the PROTOCOL.INI file will be updated with the appropriate SLDC protocol driver required by SNA Phone Connect.

If ISDN or X.25 adapters are installed in the machine along with the appropriate code to support them, the user then gets a selection panel to select either the SDLC, X.25 or IDLC protocol to be configured.

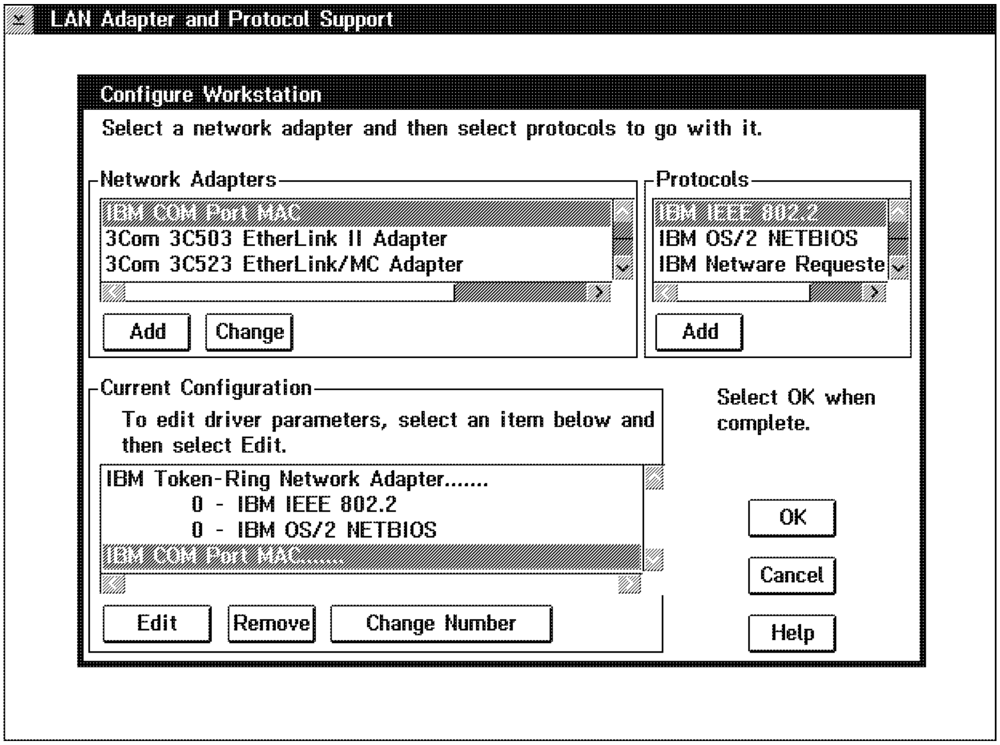
Choosing SDLC displays the same panel we have just seen above; choosing IDLC or X.25 displays additional panels to configure the logical adapter(s) required by these particular protocol drivers.

2.4.4 LAPS Configuration

Important Reminder

Please remember that you *DO NOT HAVE TO CONFIGURE LAPS* when you are configuring any of the CM/2-supplied MACs. The CM/2 configuration process will take care of automatically configuring the required entry in LAPS. However, this is only true for CM/2-supplied MACs; OEM MACs (such as the WAC adapter) must be configured separately in LAPS.

Below is the window from the LAPS configuration process that you would normally see when using LAPS. We are showing it here just to illustrate what the CM/2 configuration process has added to PROTOCOL.INI after configuration of a feature that requires a COM port. You can see, in the list of adapters, the IBM COM Port MAC entry which has been added to the current configuration.



LAN Adapter and Protocol Support

Configure Workstation

Select a network adapter and then select protocols to go with it.

Network Adapters
- IBM COM Port MAC
- 3Com 3C503 EtherLink II Adapter
- 3Com 3C523 EtherLink/MC Adapter

Protocols
- IBM IEEE 802.2
- IBM OS/2 NETBIOS
- IBM Netware Requeste

Current Configuration

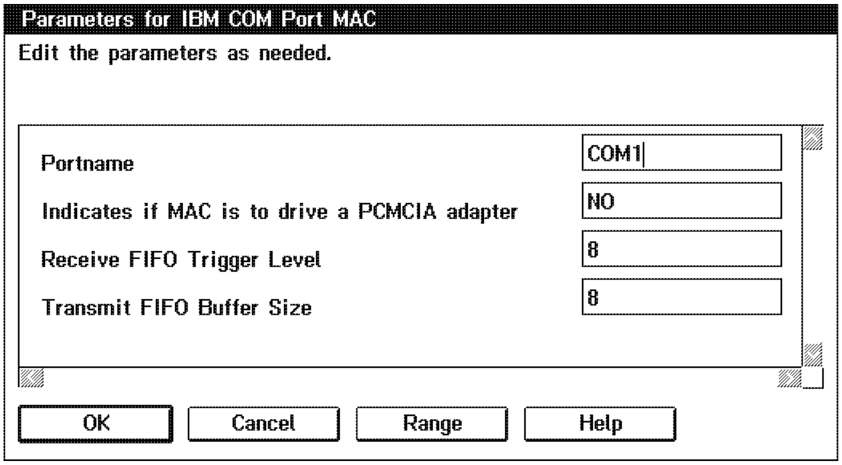
To edit driver parameters, select an item below and then select Edit.

```
IBM Token-Ring Network Adapter.......
        0 - IBM IEEE 802.2
        0 - IBM OS/2 NETBIOS
IBM COM Port MAC.......
```

Select OK when complete.

Figure 30. LAPS Configuration

And if you edit this MAC, the panel below is displayed showing the parameters that have been configured by CM/2. These values have been taken from the corresponding NIF file.



Parameters for IBM COM Port MAC

Edit the parameters as needed.

Portname	COM1
Indicates if MAC is to drive a PCMCIA adapter	NO
Receive FIFO Trigger Level	8
Transmit FIFO Buffer Size	8

Figure 31. COM Port Parameters

There are three MACs that are supplied with the CM/2 code and which will be automatically configured, by CM/2, during the PCM configuration process. They are:

1. IBM COM Port MAC for asynchronous (ADLCMAC.NIF and COMMAC.SYS)
2. IBM MPA MAC for synchronous (MPADD.NIF and MPADD.SYS)
3. IBM COM Port MAC for autosync (HAMMAC.NIF and HAMMAC.SYS)

CM/2 does *not* provide a MAC for the WAC adapter, nor does it configure this MAC automatically for you as part of the PCM configuration. Users must get the

MAC code from the WAC adapter diskette, install the code, and configure it through the LAPS configuration process.

The WAC MAC is named IBMWAC.OS2 and its related configuration file is IBMWAC.NIF. Make sure that you have Version 2.0 or above of these components. Refer to 2.5, “LAPS Configuration for WAC Adapter” on page 37.

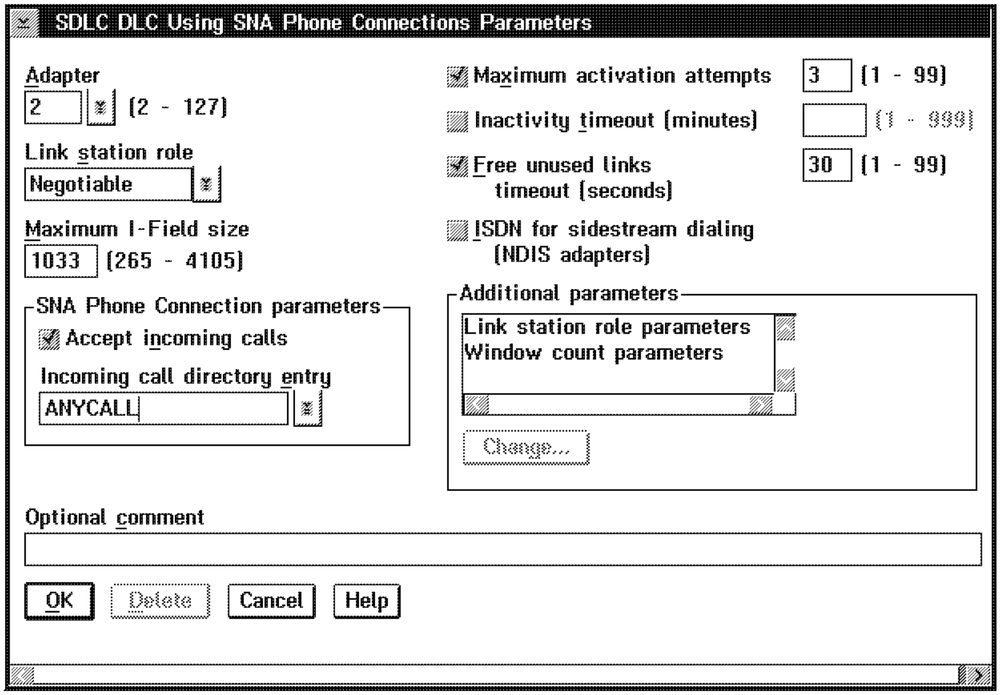
2.4.5 DLC - SDLC Using SNA Phone Connection

The “DLC - SDLC using SNA Phone Connections” profile is similar to the existing DLC - SDLC profile, except for two parameters: the logical adapter number and the incoming call directory entry specification.

In the normal DLC - SDLC profile you can specify to use adapter 0 or adapter 1, with the default value always 0. This parameter then refers to physical adapters MPA0 and MPA1.

However, in the case of SNA Phone Connect, the adapter becomes a logical adapter (or virtual port as it is sometimes referred to). The configuration process therefore requires the adapter number to be 2 or above (2 to 127 are the possible values) as 0 and 1 are reserved for the real MPA adapters.

Below is the SDLC - DLC. Using SNA Phone Connections Parameters window:


SDLC DLC Using SNA Phone Connections Parameters

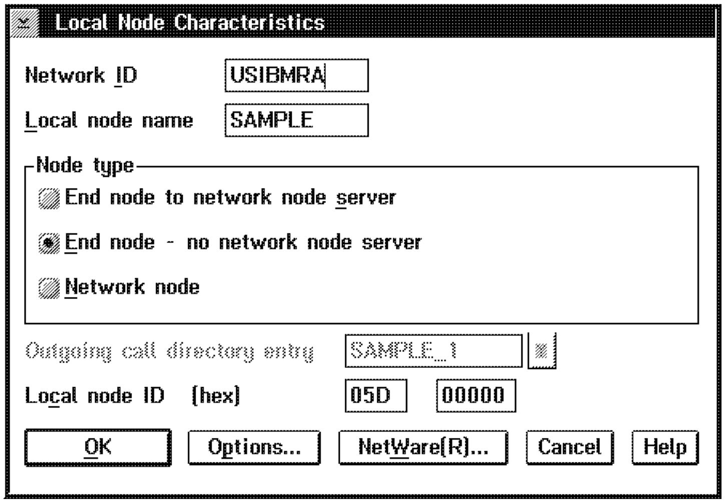
Adapter: 2 (2 - 127)
Link station role: Negotiable
Maximum I-Field size: 1033 (265 - 4105)
SNA Phone Connection parameters
☑ Accept incoming calls
Incoming call directory entry: ANYCALL
☑ Maximum activation attempts: 3 (1 - 99)
☐ Inactivity timeout (minutes): (1 - 999)
☑ Free unused links timeout (seconds): 30 (1 - 99)
☐ ISDN for sidestream dialing (NDIS adapters)
Additional parameters
Link station role parameters
Window count parameters
Optional comment:

Figure 32. DLC - SDLC SNA Phone Connect

In the figure above, notice the new parameter *Accept incoming calls*. If you want this DLC to accept incoming calls, then select the **Accept incoming calls** field. You also have to select one of the incoming call directory entry names from the list box. This incoming call directory entry was created from the Connection Manager profile as described previously.

2.4.6 SNA Local Node Characteristics

The Local Node Characteristics window has not changed from the previous version of CM/2. Here is the sample of the local node that was created for 5250 emulation to AS/400 in the previous example, using the quick configuration process.



Network ID: USIBMRA

Local node name: SAMPLE

Node type

○ End node to network node server

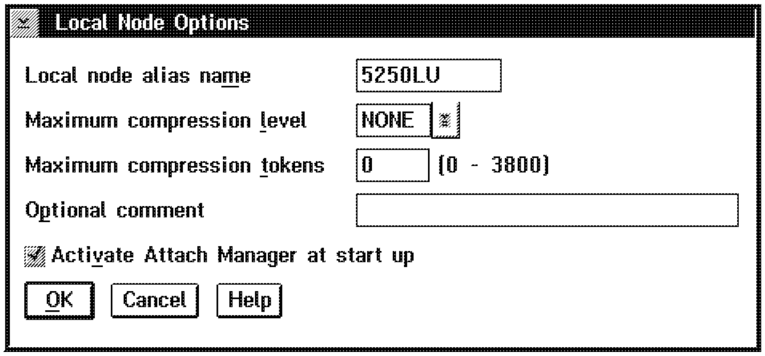
● End node - no network node server

○ Network node

Outgoing call directory entry: SAMPLE_1

Local node ID (hex): 05D 00000

Figure 33. Local Node Characteristics



Local node alias name: 5250LU

Maximum compression level: NONE

Maximum compression tokens: 0 (0 - 3800)

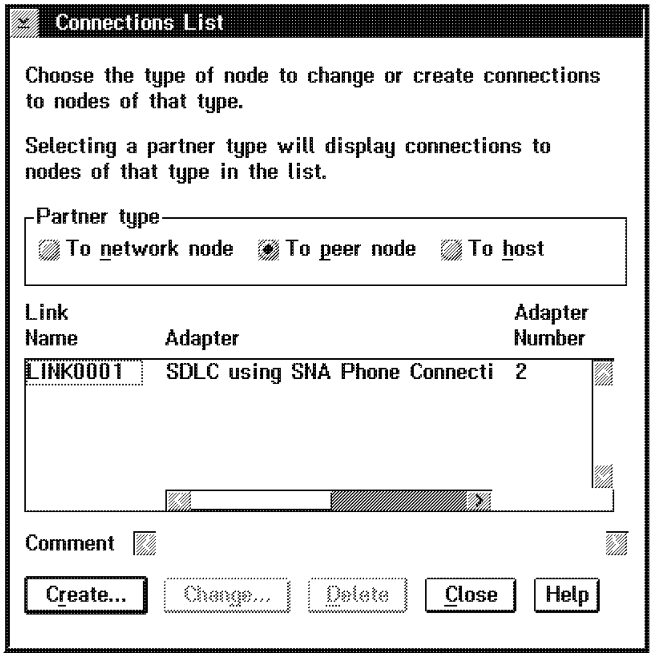
Optional comment:

☑ Activate Attach Manager at start up

Figure 34. Local Node Options

2.4.7 SNA Connections

Below is the first window from the SNA Connections profile.



Connections List

Choose the type of node to change or create connections to nodes of that type.

Selecting a partner type will display connections to nodes of that type in the list.

Partner type

○ To network node ● To peer node ○ To host

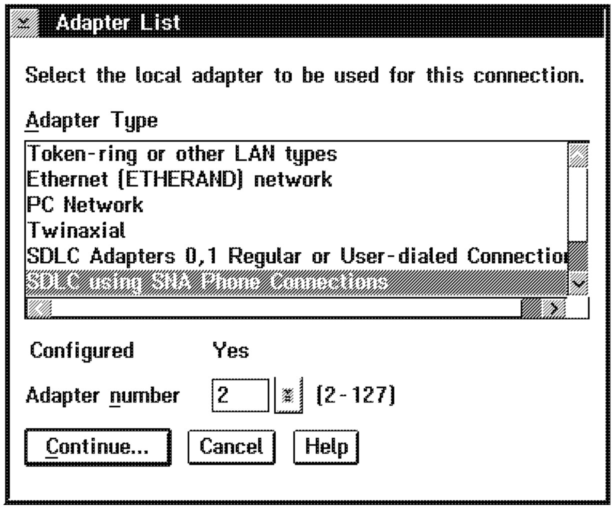
Link Name	Adapter	Adapter Number
LINK0001	SDLC using SNA Phone Connecti	2

Comment

Figure 35. SNA Connections

This link name LINK0001 is automatically assigned by CM/2 during the quick configuration process. However, you may want to change it, or you may want to create another connection.

The second window for SNA connections is the adapter list as shown here:



Adapter List

Select the local adapter to be used for this connection.

Adapter Type

- Token-ring or other LAN types
- Ethernet (ETHERAND) network
- PC Network
- Twinaxial
- SDLC Adapters 0,1 Regular or User-dialed Connectio
- SDLC using SNA Phone Connections

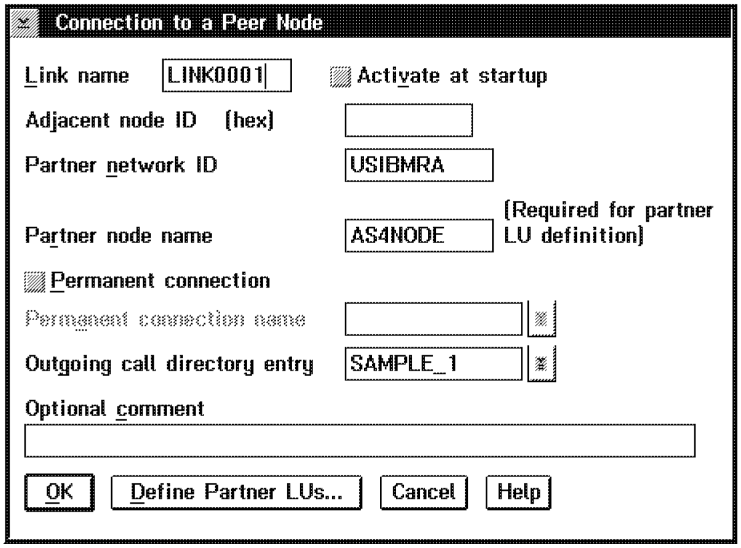
Configured Yes

Adapter number 2 (2-127)

Figure 36. Adapter List

Select **SDLC using SNA Phone Connections** to use all SNA Phone Connect links. Notice that the default Adapter number is 2. The regular (that is non-SNA Phone Connect)SDLC support uses adapters 0 and 1.

When you select **Continue...** the panel shown in Figure 37 on page 37 is displayed.



Link name LINK0001

☐ Activate at startup

Adjacent node ID (hex)

Partner network ID USIBMRA

Partner node name AS4NODE (Required for partner LU definition)

☐ Permanent connection

Permanent connection name

Outgoing call directory entry SAMPLE_1

Optional comment

Figure 37. Connection to a Peer Node

This is the window for a connection to an AS/400 for 5250 emulation using SNA Phone Connect.

There are two parameters from the above window that determine the destination apart from your partner name, they are:

- Outgoing call directory entry - This is a list box; opening it displays all the currently configured outgoing call directory entries, from which you select the one that represents the destination that you want to dial out to when you start this connection.
- If this is a permanent connection (leased), check the Permanent connection box, which opens up the Permanent connection name and select the name that was specified when you configured the PCM earlier.

> **Note**
>
> Even if you specify the name in lowercase, the verification process will force it to uppercase, so make sure you use uppercase in the PCM configuration.

Note that you would normally not specify ″Activate at startup″ for a switched connection because you usually want the link activation to take place when the application requires it. However, if you do want the link to be activated when CM/2 starts, then select the ″Activate at startup″ check box.

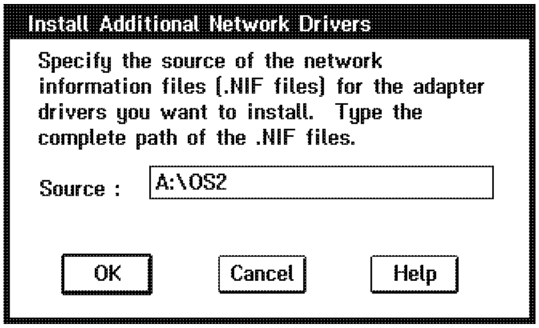
2.5 LAPS Configuration for WAC Adapter

The WAC MAC, which is necessary to use the WAC adapter, is *not* supplied with CM/2, nor is it automatically configured by CM/2 like the other MACs (COM, MPA and AutoSync).

The WAC MAC comes with the WAC adapter, but you have to ensure that you have the latest release of the WAC MAC (Version 2.x).

The installation process for this particular MAC is similar to other MACs. Using the LAPS program, select INSTALL on the main LAPS window, and specify where the drivers reside, for example the A: drive. (The README on the diskette contains the appropriate instructions for this.)

As shown in the window below, make sure you specify the OS2 subdirectory on the WAC diskette that you insert in the A: drive, otherwise, no NIF file will be found. The process will copy the files IBMWAC.NIF and IBMWAC.OS2 to the IBMCOMMACS subdirectory, and the files WAC.MSG and WACH.MSG to the IBMCOM subdirectory.



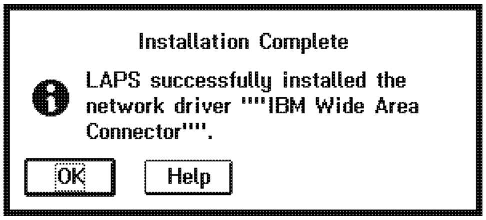
Install Additional Network Drivers

Specify the source of the network information files (.NIF files) for the adapter drivers you want to install. Type the complete path of the .NIF files.

Source : A:\OS2

Figure 38. Installing OS/2 WAC Device Driver

There will be a completion message when you complete the device driver installation as shown below:

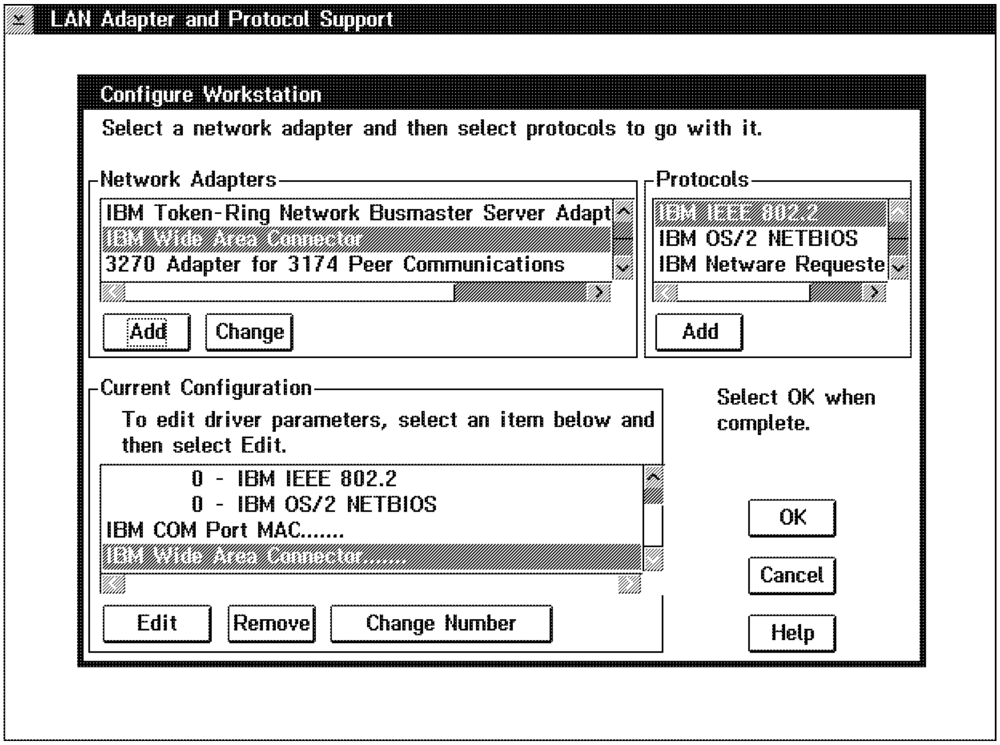


Installation Complete

LAPS successfully installed the network driver ""IBM Wide Area Connector"".

Figure 39. Installation Completed Message

Then you can continue to configure it by selecting CONFIGURE on the LAPS window. Again, this is no different from other MACs. Select the **IBM Wide Area Connector** entry in the Network Adapters List, and select **Add.**



LAN Adapter and Protocol Support

Configure Workstation

Select a network adapter and then select protocols to go with it.

Network Adapters

IBM Token-Ring Network Busmaster Server Adapt
IBM Wide Area Connector
3270 Adapter for 3174 Peer Communications

Protocols

IBM IEEE 802.2
IBM OS/2 NETBIOS
IBM Netware Requeste

Current Configuration

To edit driver parameters, select an item below and then select Edit.

0 - IBM IEEE 802.2
0 - IBM OS/2 NETBIOS
IBM COM Port MAC.......
IBM Wide Area Connector.......

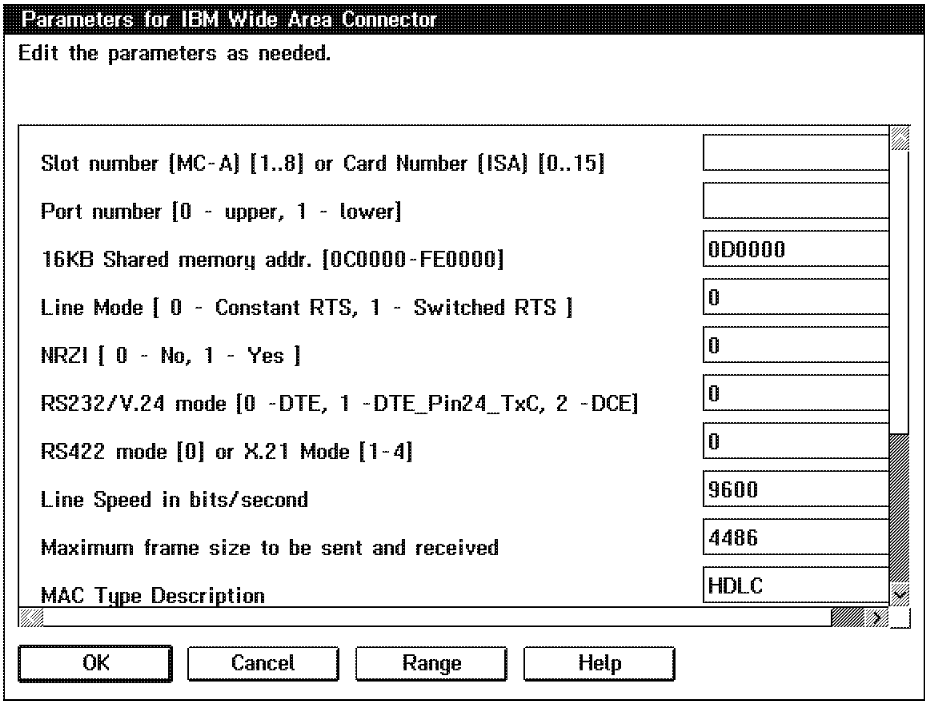
Select OK when complete.

Figure 40. Configuring MAC for WAC Adapter

Important Reminder

If you are using SNA Phone Connect over the WAC, there is no need to associate one of the LAN protocols with the WAC MAC. The binding statement, between a protocol driver and a MAC, which is normally the result of this association (of a protocol to a MAC) will be done by the CM/2 configuration process; CM/2 will include a statement in PROTOCOL.INI for a static BIND between the SDLC protocol stack and a virtual MAC (SDLCVMAC for example), and the association with the WAC MAC will be done dynamically by the PCM when you actually make a call over the WAC adapter.

You now have to configure the WAC MAC; even though you will configure a WAC PCM in the CM/2 Port Connection Manager profile, which will use this MAC, the CM/2 configuration process assumes that the MAC is already configured. As indicated earlier, this is only for the WAC MAC; the other MACs that are supplied with CM/2 are automatically configured when you actually configure the PCM that requires it.



Parameters for IBM Wide Area Connector

Edit the parameters as needed.

Slot number [MC-A] [1..8] or Card Number [ISA] [0..15]	
Port number [0 - upper, 1 - lower]	
16KB Shared memory addr. [0C0000-FE0000]	0D0000
Line Mode [0 - Constant RTS, 1 - Switched RTS]	0
NRZI [0 - No, 1 - Yes]	0
RS232/V.24 mode [0 -DTE, 1 -DTE_Pin24_TxC, 2 -DCE]	0
RS422 mode [0] or X.21 Mode [1-4]	0
Line Speed in bits/second	9600
Maximum frame size to be sent and received	4486
MAC Type Description	HDLC

Figure 41. WAC Parameters

Note

If you are using two ports on the WAC adapter, then remember that you have to configure TWO instances of the WAC MAC, one per port.

The following parameters need to be configured. (Note: You can find more details on these in the IBM WAC Technical Reference on the WAC diskette.)

- **Slot number**

  For a Micro Channel machine, this is the actual physical slot number in which the WAC adapter is inserted. For an AT-bus machine, what you specify here is a logical number that has no relation to the physical location of the card but which is dependent on the settings of the DIP switches on the adapter. See the README file to determine the logical card number that should be used with the switch settings that you have on your actual card.

- **Port number**

  This identifies which of the two ports on the IBM WAC adapter this MAC is being configured for. 0 for upper port, which is the one farthest from the system board, or 1 for lower port, which is the one closest to the system board.

- **Line Mode**

  This identifies half-duplex or full-duplex transmission. 0 is for full-duplex and 1 for half-duplex. Specify 1 if you are secondary on a multidrop line or specify 0 for point-to-point lines and for the primary end of SDLC lines.

- **NRZI**

  This identifies the data encoding scheme. It should match the value specified at the other end; however, the value here does not have any impact since it will be overridden anyway by the value configured in the PCM.

- **RS232/V.24 mode**

  This specifies who does the clocking; 0 if the modem supplies the clocking, 1 if the DTE is to generate the transmit clock and 2 if the DTE supplies both transmit and receive clocking.

- **Line Speed in bits/second**

  Ignore if the modem supplies the clocking. Use only if the WAC adapter is to provide clocking; this value is overridden by the value configured in the PCM.

- **Maximum frame size to be sent and received**

  Must be equal to or larger than the maximum I-field size used. To conserve ring 0 storage, you should try and match the maximum I-field size.

- **MAC Type Description**

  Do NOT set to SDLC - MUST BE SET TO HDLC

- **Maximum number of outstanding transmit requests**

  Set to one higher than the SEND WINDOW count, at a minimum.

- **ANDIS PCM support**

  This should be set to 1. The default is 0.

- **Link connection type**

  Doesn′t matter, because the PCM will override this.

- **Portname displayed in the PPAT table**

  You can use any name you like, but **it must match** the name that you specified in the PCM configuration (case sensitive).

- **Minimum number of flags between transmit flags**

  Should be set to 2 as a minimum, and probably better at 5 to be safe. Increasing the number of flags increases the time between frames and gives more time to the receiver for processing a frame before receiving the next one.

2.6 Telephone Directory

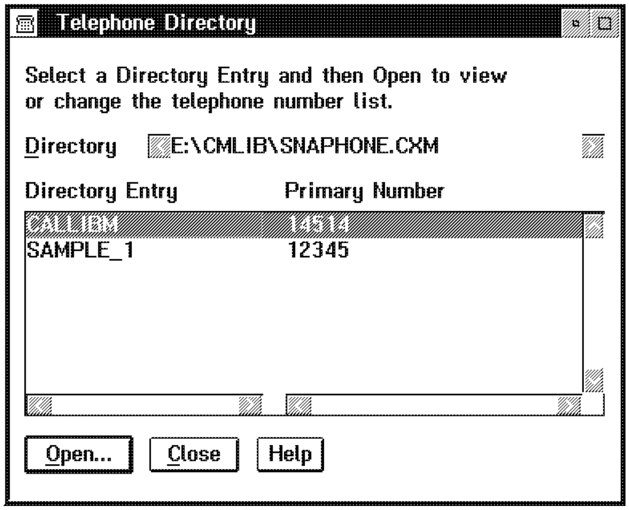
One parameter which you might need to change often is the telephone number of a particular outgoing call directory entry.

In order to avoid having to go through the CMSETUP and the Connection Manager configuration, just to change a telephone number, a small application called the Telephone Directory has been supplied which allows changing telephone numbers stored in the SNAPHONE.CXM file. The changes apply immediately, so you do not need to stop and re-start CM/2.

This application can be called in different ways:

- From the Telephone Directory icon in the CM/2 folder
- Issue the CMTELNUM command on a command line
- Use the Setting pull-down on the emulator window

Here is the Telephone Directory window:



Select a Directory Entry and then Open to view or change the telephone number list.

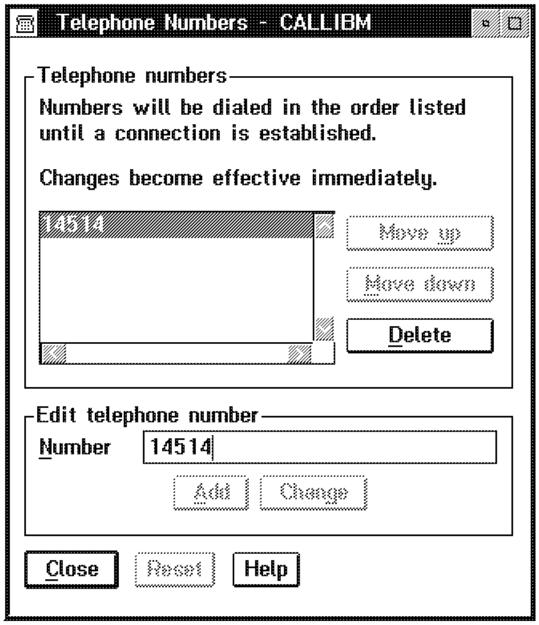
Directory E:\CMLIB\SNAPHONE.CXM

Directory Entry	Primary Number
CALLIBM	14514
SAMPLE_1	12345

Figure 42. Telephone Directory

When you select an entry, you can change the telephone number, add alternate telephone numbers or delete a telephone number.

You can also change the order of telephone numbers, that is the primary number and all other alternate numbers.



Telephone numbers

Numbers will be dialed in the order listed until a connection is established.

Changes become effective immediately.

14514

Edit telephone number

Number 14514

Figure 43. Telephone Number

Chapter 3. SNA Phone Connect Configuration Files

This chapter includes a brief discussion of the CM/2 configuration files, the SNA Phone Connect related files, and some of the relationships between these files.

The objective is first to provide a level set on the subject of configuration files, for those users that have little familiarity with these files, and to illustrate how the files are being used by the SNA Phone Connect feature. Second, for problem determination purposes, it is important to understand the relationship between these files and what information they contain.

3.1 Configuration Files

```
           CM/2 Profiles              Configuration          Operational
                                          Files             Binary Files
           DLC profiles
           3270 profile                (Binary)
           5250 profile                cfgname.CFG            cfgname.CFG
           X.25 Profiles
           ACDI Profiles                            V
           SRPI Profile                             E
                                       (ASCII)      R
                                       cfgname.NDF  I
           Local Node                               F
           SNA Connections                          Y
           SNA Features                                       cfgname.CF2
           Gateway                     (Binary)
           SNA LUA APIs                cfgname.SEC



  PIF      SNA Phone Connect           (ASCII)
  Files     Port Connection            NETWORK.INI
               Manager

  NIF
  Files         L A P S                (ASCII)
                                       PROTOCOL.INI



           SNA Phone Connect           (Binary)
             Connection                SNAPHONE.CXM
               Manager


           Telephone Directory
                Utility
```

Figure 44. Configuration Files and Their Relationships

This is a summary illustration of the CM/2 configuration files, and their general relationship.

All of these files reside in CMLIB, except for the PROTOCOL.INI file and the NIF files, which are in the IBMCOM and IBMCOM\MACS subdirectories respectively.

© Copyright IBM Corp. 1995

- **Cfgname.CFG**

  This file is a binary file which contains the configuration information produced from the profiles shown to the left in Figure 44 on page 43. A user cannot therefore easily look at its content other than through the interactive configuration panels, unless you use the CID CMRECORD utility to produce a response file version of all the configuration parameters, from all the configuration files. The file produced however can be quite large and requires some knowledge of the significance of some of the keywords to be able to interpret the information. Again, the easiest way is to use the CMSETUP interactive process.

- **Cfgname.NDF**

  This file contains all the SNA/APPC/APPN related information and is very readable. In fact, in this case, it is probably easier and faster to look at the NDF file than it is to use the interactive configuration process. However, it is not recommended to manually update the NDF file, unless you are an experienced user and required to do so.

- **Cfgname.SEC**

  This file contains the security information, such as session security passwords, etc.

  Note

  The NDF and SEC files, after the verification process, are combined into one binary operational file called the CF2 file. The CFG and CF2 files are the ones used by CM/2 at startup time; if you update a configuration file while it is operational, and decide to dynamically update some of the resources, then the CF2 file will be updated on the fly, provided the resources that are being updated are not active at the time.

- **SNAPHONE.CXM**

  Contains all the incoming and outgoing call directory entries configured through the Connection Manager profile. It is a binary file.

  The SNAPHONE.CXM can also be updated by the Telephone Directory Utility. You can update existing telephone numbers, add alternate telephone numbers, delete telephone numbers and change the order of the numbers.

  Notice that during the Connection Manager configuration, incoming and outgoing call directory entries in existing directory entry files that are different than SNAPHONE.CXM will be copied to SNAPHONE.CXM.

- **NETWORK.INI**

  Contains a list PCMs to be loaded and started by CM/2 at startup time. This file is in ASCII format and therefore can be viewed with any editor.

  Important

  This file should not be altered by the user, even though it is possible to edit it.

  Each PCM section consists of:

  - PCM dynamic link library to load
  - PCM entry point to call for the PCM
  - PIF filename
  - PCM name

- An indication of whether to start the PCM. Default value is *no*, until you configure a specific PCM.

The following is a sample of part of the NETWORK.INI file:

```
[CXM]
   NETWORKTYPE = ANALOG

[NETWORKDEFS]
   ANALOG = †Analog network†,NETWAE2.SUP,SNAPHONE.CXM  1

[PROT_MAN]  2
   DRIVERNAME = PROTMAN$

[ISDN]  3

   DLL = ACSVSPCM
   ENTRY = StartVPCM
   PIF = ATT3820.PIF
   PCMNAME = ATT3820
   AUTOSTART = NO  4
   TITLE = AT&T Comsphere 3820

   DLL = ACSVSPCM
   ENTRY = StartVPCM
   PIF = ATTDP.PIF
   PCMNAME = ATTDP
   AUTOSTART = NO
   TITLE = AT&T DataPort
         .
         .
         .
         .

   DLL = ACSVSPCM
   ENTRY = StartVPCM
   PIF = IBM7855.PIF
   PCMNAME = IBM7855
   AUTOSTART = NO
   TITLE = IBM 7855 Modem

         .
         .
         .
         .
   DLL = ACSVSPCM
   ENTRY = StartVPCM
   PIF = APPFXMT.PIF
   PCMNAME = APPFXMT
   AUTOSTART = NO
   TITLE = Practical Peripherals PM9600FXMT Modem

   DLL = ACSVSPCM
   ENTRY = StartVPCM
   PIF = AUTOSYNC.PIF
   PCMNAME = AUTOSYNC
   AUTOSTART = NO
   TITLE = User-Defined AutoSync Switched Connection Modem
```

Figure 45. Sample of NETWORK.INI

Brief explanation of each statement:

Label	**Description**

1 This is the name of the CXM file. In previous CM/2 versions, when using the ISDN support, this file name could be a name other than SNAPHONE. A of version 1.11 though, there is only one CXM file allowed in the system and its name must be SNAPHONE.CXM.

When migrating from a previous version, all *.CXM files are automatically merged into SNAPHONE.CXM as part of the migration process.

2 This is the name of the protocol manager.

3 These are the PCM entries. Each PCM entry identifies the name of the DLL, the entry point in the DLL, the PIF file name, the PCM name, the Autostart parameter and a brief description for that particular PCM.

4 The Autostart parameter defaults to NO and will be changed to YES by the PCM Configuration profile when you configure this PCM. When Autostart = YES, this PCM is started automatically at CM startup time.

When configuring an SNA Phone Connection, NETWORK.INI is read by the CM/2 configuration process, then each PCM′s PIF file is read to determine the type of modem by looking at the synchronicity (asynchronous, synchronous or autosync) and the permanent connection specification (switched or non-switched), and this determines which PCMs will be listed in the list box when you select a connection type.

Note

For additional information on the NETWORK.INI file, please refer to *ISDN Port Connection Manager (PCM) Programming Reference*

- **PROTOCOL.INI**

  Contains (amongst other things related to LAPS) a section for each configured PCM, a section for each corresponding MAC, and a section for each protocol driver.

  Even though the PROTOCOL.INI entries are normally produced by the LAPS configuration process, the CM/2 PCM configuration process will register the proper entries in PROTOCOL.INI for all SNA Phone Connect MACs except the "WAC MAC."

  The NIF files are used as input during LAPS configuration to determine which parameters should be displayed on the configuration panel and the default values for some of the parameters of that particular MAC.

  The following is a sample PROTOCOL.INI file:

```
[SDLC_SWNET]  1

   DRIVERNAME = SDLCSNET
   BINDINGS = SDLCVMAC0, SDLCVMAC1
   CFGTYPE = Locked

[IBM7855]  2

   DIALOGTYPE = †ATCMD.DDF†
   SYNCHRONICITY = †Asynchronous†
   PORTNAME = COM1
   ACCPTINCCALL = †NO†
   MODEMCLASS = †V.32†
   SERIALPORTSPEED = 19200
   AUTOBAUDDETECT = †Off†
   FLOWCONTROL = †RTS/CTS†
   PERMCONNECTION = NO
   CFGTYPE = Locked
   INITIALIZATION1 = †ATI3\CR†
   INITIALIZATION2 = †ATE1Q0V1X4S7=60S0=2\\R2\\Q2\\X0\\N3\\V1&D2&S1&R0&C1&I0\CR†
   INITIALIZATION3 = †ATE1Q0V1X4S7=60S0=0\\R2\\Q2\\X0\\N3\\V1&D2&S1&R0&C1&I0\CR†
   DIALPREFIX = †ATDT†
   DIALSUFFIX = †\CR†
   SUCCESS = †OK\CR\LF†
   FAILURE = †ERROR\CR\LF†
   CONNECTPREFIX = †CONNECT†
   CONNECTSUFFIX = †\CR\LF†
   ESCAPE = †+++†
   HANGUP = †ATH\CR†
   RINGBACK = †RING\CR\LF†
   BUSY = †BUSY\CR\LF†
   NOCARRIER = †NO CARRIER\CR\LF†
   NODIALTONE = †NO DIALTONE\CR\LF†
   NOANSWER = †NO ANSWER\CR\LF†
   VOICE = †VOICE\CR\LF†
   RING = †RING\CR\LF†

[ADLCMAC_nif]  3

   DRIVERNAME = ADLCMAC$
   PORTNAME = †COM1†
   PCMCIA = †NO†
   RX_FIFO_SIZE = 8
   TX_FIFO_SIZE = 8
```

Figure 46. Sample of PROTOCOL.INI

Brief explanation of each statement:

Label	**Description**
1	SDLC protocol driver entry. Note that this statement binds the SDLC protocol stack to the two SDLC virtual MACs. Binding of the virtual MAC to the real MAC will be done dynamically, by the PCM, at connect time
2	PCM definition for an IBM 7855 modem, used in asynchronous mode
3	MAC definition for an asynchronous adapter

- **PIF files**

  As described previously, the PCM entries in NETWORK.INI have a parameter which identifies the PIF file to be used for that specific PCM, and in turn, the

PIF file has an entry which identifies the corresponding NIF files to be used when configuring the MAC entry.

What is a PIF file? The PIF file is what determines, during the PCM configuration, which parameters will be displayed on the PCM configuration panel, the default value for some of these parameters, and also the values that some of these parameters can be set to, which could appear in a list box.

Once the PCM configuration is complete, the PROTOCOL.INI file is updated using the data from the PIF file. Refer to 3.2, “File Relationships” on page 56.

Below is a sample PIF file for an IBM7855 PCM. The PCM configuration panel which is displayed for an IBM7855 PCM was shown in Figure 14 on page 22 and we have reproduced that panel below the next figure as well.

```
[IBM7855]
DLL = ACSVPCM
ENTRY = StartVPCM
PCMCIA = NO  1
NIF = ADLCMAC.NIF  2


[DialogType]
Type = QUOTEDSTRING
Default = †ATCMD.DDF†  3
Editable = NO
Paneled = NO

[Synchronicity]
Display = D1
Type = QUOTEDSTRING
Default = †Asynchronous†  4
Editable = NO
Help = H1

[PortName]
Display = D6
Type = STRING
StrLength = 255
Optional = NO
Editable = Yes
Help = H6

[AccptIncCall]
Display = D27
Type = QUOTEDSTRING
Default = †NO†  5
Set = †NO†,†YES†
Optional = NO
Help = H27

[ModemClass]
Display = D2
Type = QUOTEDSTRING
Default = †V.32†
Set = M1, M2, M3, M4, M5, M6
Setvalues = †Unspecified†,†V.22†,†V.22bis†,†V.32†,†V.32bis†,†Proprietary†
Optional = NO
Help = H2
Paneled = NO

[SerialPortSpeed]
Display = D4
Type = Decimal
Default = 19200  6
Set = 57600,38400,19200,9600,2400
Optional = NO
Help = H4A

[AutoBaudDetect]
Display = D3
Type = QUOTEDSTRING
Default = †Off†
Set = ON, OFF
SetValues = †On†,†Off†
Optional = NO
Help = H3
Paneled = NO
```

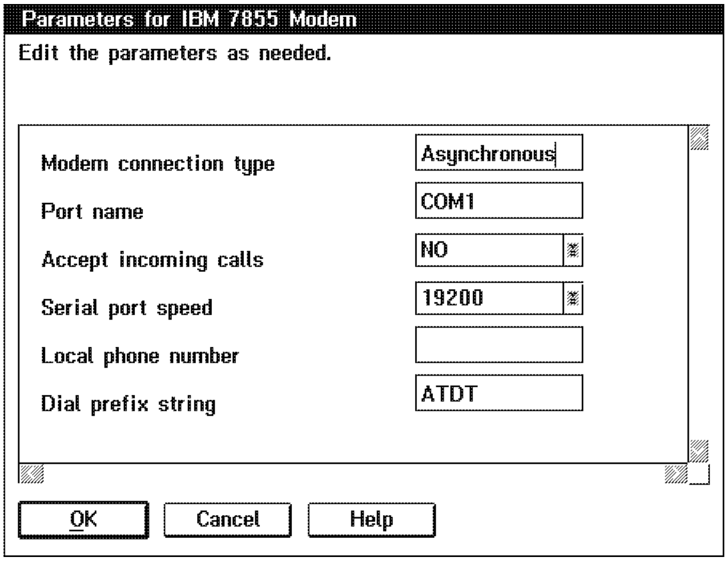
Figure 47 (Part 1 of 2). Sample PIF File

```
     o
     o
     o

  [Ring]
  Display = D26
  Type = QUOTEDSTRING
  StrLength = 255
  Default = †RING\CR\LF†
  Optional = NO
  Help = H26
  Paneled = NO
```

Figure 47 (Part 2 of 2). Sample PIF File

Brief explanation of each statement:

Label	**Description**
1	Identifies that this is not a PCMCIA modem.
2	Name of the corresponding NIF file to be used for configuring the associated MAC
3	Name of the Dialog Descriptor File (DDF) to be used by the PCM to communicate with the modem
4	Default synchronicity value, in this case, asynchronous.
5	Default for the incoming call parameter in the PCM configuration (NO)
6	Default serial port speed in PCM configuration to **19200**. The SET parameter identifies the values that will be listed as selectable in the list box for the serial port speed.



Parameters for IBM 7855 Modem

Edit the parameters as needed.

Modem connection type: Asynchronous
Port name: COM1
Accept incoming calls: NO
Serial port speed: 19200
Local phone number:
Dial prefix string: ATDT

Figure 48. IBM 7855 PCM Panel

Note

For additional information on PIF files, please refer to *ISDN Port Connection Manager (PCM) Programming Reference*

- **NIF files**

  A NIF file has a role similar to the PIF file but it applies to a MAC configuration instead of a PCM configuration. Therefore, just as the PIF file did, it determines which parameters will be displayed on the MAC configuration panel (if you were using LAPS to configure), the default value for some of these parameters, and also the values that some of these parameters can be set to, which could appear in a list box.

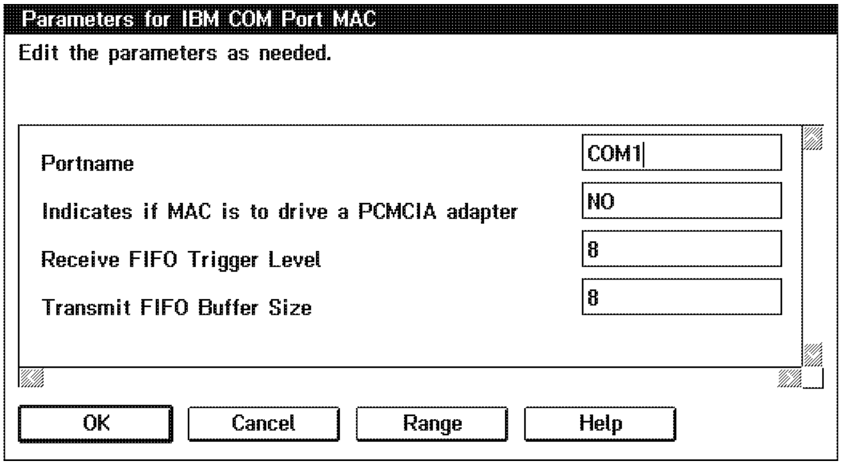
  Below is an example of a NIF file for an asynchronous MAC, that is ADLCMAC.NIF. If you were using LAPS to configure this MAC, then the panel that would be displayed has been shown in Figure 31 on page 33. We have reproduced this panel below the next figure for your convenience.

```
[ADLCMAC]
 Type       = NDIS_SNGL
 Title      = IBM COM Port MAC
 Version    = 1.0
 DriverName = ADLCMAC$  1
 NoBind     = Yes

[FILE]
 Name = COMMAC.SYS
 Path = \IBMCOM\MACS

[PORTNAME]
 Display  = †Portname†
 Type     = String
 StrLength = 16
 Default   = †COM1†  2
 Set       = †COM1†,†COM2†,†COM3†,†COM4†,†COM5†,†COM6†,†COM7†,†COM8†
 Optional = Yes
 Editable = Yes
 Help     = †Tells the MAC what portname to display in the Physical Port
Attributes Table (PPAT). This must be set and must be the string COMx where
x ranges from 1 to 8. The PORTNAME maps the MAC to a particular adapter.
The default mapping based on the PORTNAME is as follows:   5
   COM1=base address x3f8,  IRQ level 4;
   COM2=base address x2f8,  IRQ level 3;
   COM3=base address x3220, IRQ level 3;
   COM4=base address x3228, IRQ level 3;
   COM5=base address x4220, IRQ level 3;
   COM6=base address x4228, IRQ level 3;
   COM7=base address x5220, IRQ level 3;
   COM8=base address x5228, IRQ level 3;†

[PCMCIA]
 Display  = †Indicates if MAC is to drive a PCMCIA adapter†
 Type     = String
 StrLength = 3
 Default   = †NO†  3
 Set       = †YES†,†NO†
 Optional = Yes
 Editable = Yes
 Help     = †This indicates if the adapter is a PCMCIA adapter.  This must
set to YES if using a PCMCIA adapter!†

[RX_FIFO_SIZE]
display = †Receive FIFO Trigger Level†
type = decimal
range = 1-16
default = 8
optional = yes
editable = yes
virtual = no
help = †This parameter specifies the number of bytes that will be used to
 trigger the asynchronous FIFO support for this adapter.  This parameter
 applies to asynchronous communications ports with 16550A (or better) UARTS.
 This parameter affects performance and the number of
 interrupts the computer will receive for a given number of bytes. For
 low speed operation (up to 19,200) you normally will want to use
 a fifo size of 16.  However, for high speed operation (38,400 or higher)
 you normally want to use an rx fifo size of 8.† 4

[TX_FIFO_SIZE]
display = †Transmit FIFO Buffer Size†
type = decimal
range = 1-16
default = 8
optional = yes
editable = yes
virtual = no
help = †This parameter specifies the number of bytes that will be transmitted
 at a time using the asynchronous FIFO support for this adapter. This parameter
 applies to asynchronous communications ports with 16550A (or better) UARTS.
 This parameter affects performance and the number of
 interrupts the computer will need to transmit a given number of bytes.
 You normally will want to use the maximum value of 16†
```

Figure 49. Sample NIF File

Note:

1. This is the name of the asynchronous MAC DLC
2. The name of the COM port to be managed by this MAC. Note the SET parameter which indicates the possible values that this parameter can take.
3. PCMCIA set to NO by default. PROTOCOL.INI.
4. Text displayed when the HELP (PF1) key is pressed when the cursor is on this parameter.
5. This is an important base address and interrupt level for each COM port to be configured when using SNA Phone Connect.



Parameters for IBM COM Port MAC

Edit the parameters as needed.

Portname	COM1
Indicates if MAC is to drive a PCMCIA adapter	NO
Receive FIFO Trigger Level	8
Transmit FIFO Buffer Size	8

Figure 50. COMMAC Parameters

- **DDF (Dialog Descriptor File)**

  A Dialog Descriptor File (DDF) is a file which is used by the PCM when it wants to start a dialog with a modem. Since modems are not all the same, the PCM needs to know the sequence of the commands required for a particular modem type, and what to do on receipt of certain responses from the modem.

  The DDF is like a pre-programmed set of commands, the sequence of which is altered dependent on the responses received from the modem. The PCM configuration data recorded in PROTOCOL.INI tells the PCM which DDF file it should use when the PCM needs to start a dialog with the modem.

  This dialog, or exchange of commands and data with the modem can easily be seen in a CM/2 trace of the dialog. See Chapter 13, “Problem Determination for SNA Phone Connect” on page 197 for more information on tracing.

  The DDF files are installed in the CMLIB subdirectory. They are considered internal files and should *not* be modified by the user. There is a DDF for each major type of modem operation, such as listed below:

Table 1 (Page 1 of 2). DDF and Its Corresponding Type of Connection

DDF	**Connection**
ATCMD.DDF	Asynchronous

Table 1 (Page 2 of 2). DDF and Its Corresponding Type of Connection

DDF	**Connection**
HAMCMD.DDF	AutoSync
V25BIS.DDF	Synchronous
NODIALOG.DDF	Leased line
SW56V25B.DDF	Switched 56 Kbps CSU/DSU

The following is an example of the ATCMD DDF file used with asynchronous modems:

```
[DIALOG ENTRY]
Dialog = Initialize,  InitDelayCommand
Dialog = InitNoInc,   InitNoIncDelayCommand
Dialog = Originate,   DialCommand
Dialog = Ring,        RingCommand
Dialog = Answer,      AnswerCommand
Dialog = Hangup,      HangupDelayCommand

[ACTION GROUP]
Name = InitDelayCommand
Action = StartTimer, 1
Action = WaitForResponse, InitDelayResponse

[RESPONSE GROUP]
Name = InitDelayResponse
Response = Timeout, Init1Command

[ACTION GROUP]
Name = Init1Command
Action = SendString, Initialization1
Action = StartTimer, 10
Action = WaitForResponse, Init1Response

[RESPONSE GROUP]
Name = Init1Response
Response = ReceiveString, Success,   Init2Command
Response = ReceiveString, Failure,   Init2Command
Response = ReceiveString, NoCarrier, InitDelayCommand
Response = Timeout, NoResponseExit

[ACTION GROUP]
Name = Init2Command
Action = SendString, Initialization2
Action = StartTimer, 10
Action = WaitForResponse, Init2Response
      o
      o
      o
      o
      o
[ACTION GROUP]
Name = ModemBusyExit
Action = ExitDialog, ModemBusy

[ACTION GROUP]
Name = DelayedExit
Action = ExitDialog, Delayed

[ACTION GROUP]
Name = ForbiddenExit
Action = ExitDialog, Forbidden
```

Figure 51. Sample DDF File

3.2 File Relationships

As previously discussed, NETWORK.INI contains a list of PCMs to be loaded and started by CM/2.

If there are no PCM configured, then all AUTOSTART parameters will have a default value of NO. Once you configure a PCM, then that particular PCM entry will be changed to YES.

For example, if you configure an IBM 7855 modem, then the NETWORK.INI file will be updated as follows:

```
NETWORK.INI (before)                    NETWORK.INI (after)

[CXM]                                   [CXM]
  NETWORKTYPE = ANALOG                    NETWORKTYPE = ANALOG

[NETWORKDEFS]                           [NETWORKDEFS]
  ANALOG = †Analog network†....           ANALOG = †Analog network†....

[PROT_MAN]                              [PROT_MAN].
  DRIVERNAME = PROTMAN$                   DRIVERNAME = PROTMAN$

[ISDN]                                  [ISDN]
         .                                       .
         .                                       .
  DLL = ACSVSPCM                          DLL = ACSVSPCM
  ENTRY = StartVPCM                       ENTRY = StartVPCM
  PIF = IBM7855.PIF                       PIF = IBM7855.PIF
  PCMNAME = IBM7855                       PCMNAME = IBM7855
  AUTOSTART = NO                          AUTOSTART = YES
  TITLE = IBM 7855 Modem                  TITLE = IBM 7855 Modem
         .                                       .
         .                                       .
```

Figure 52. NETWORK.INI Update

The IBM7855 PCM points to the IBM7855.PIF file which contains the parameters to be used to build the required PCM entries in PROTOCOL.INI, as illustrated in Figure 53 on page 57.

```
 NETWORK.INI (after update)

 [CXM]
   NETWORKTYPE = ANALOG
 [NETWORKDEFS]
   ANALOG = †Analog network†....
 [PROT_MAN].
   DRIVERNAME = PROTMAN$
 [ISDN]
         .
   DLL = ACSVSPCM
   ENTRY = StartVPCM
   PIF = IBM7855.PIF                                     IBM7855.PIF
   PCMNAME = IBM7855
   AUTOSTART = YES                Note:                  [IBM7855]
   TITLE = IBM 7855 Modem         The PIF determine the  DLL = ACSVPCM
         .                        name of the NIF file,  ENTRY = StartVPCM
                                   that is, ADLCMAC.NIF  PCMCIA = NO
                                                          NIF = ADLCMAC.NIF

Note:                                                    [DialogType]
The SDLC_SWNET statement is                              Type = QUOTEDSTRING
added to PROTOCOL.INI for binding the                    Default = †ATCMD.DDF†
SDLC protocol stack to the VMACs.                        Editable = NO
                                                         Paneled = NO

                                                         [Synchronicity]
 PROTOCOL.INI                                            Display = D1
                                                         Type = QUOTEDSTRING
 [SDLC_SWNET]                                            Default = †Asynchronous†
   DRIVERNAME = SDLCSNET                                 Editable = NO
   BINDINGS = SDLCVMAC0, SDLCVMAC1                       Help = H1
   CFGTYPE = Locked
                                                         [PortName]
 [IBM7855]                                               Display = D6
   DIALOGTYPE = †ATCMD.DDF†                              Type = STRING
   SYNCHRONICITY = †Asynchronous†                        StrLength = 255
   PORTNAME = COM1                                       Optional = NO
   ACCPTINCCALL = †NO†                                   Editable = Yes
   MODEMCLASS = †V.32†                                   Help = H6
   SERIALPORTSPEED = 19200
   AUTOBAUDDETECT = †Off†                                [AccptIncCall]
   FLOWCONTROL = †RTS/CTS†                               Display = D27
   PERMCONNECTION = NO                                   Type = QUOTEDSTRING
   CFGTYPE = Locked                                      Default = †NO†
   INITIALIZATION1 = †ATI3\CR†                           Set = †NO†,†YES†
   INITIALIZATION2 = †ATE1Q0V1X4S7...                    Optional = NO
   INITIALIZATION3 = †ATE1Q0V1X4S7...                    Help = H27
   DIALPREFIX = †ATDT†
   DIALSUFFIX = †\CR†                                    [ModemClass]
   SUCCESS = †OK\CR\LF†                                  Display = D2
   FAILURE = †ERROR\CR\LF†                               Type = QUOTEDSTRING
   CONNECTPREFIX = †CONNECT†                             Default = †V.32†
   CONNECTSUFFIX = †\CR\LF†                              Set = M1, M2, M3, M4, M5, M6
   ESCAPE = †+++†                                        Setvalues = †Unspecified†,...
   HANGUP = †ATH\CR†                                     Optional = NO
   RINGBACK = †RING\CR\LF†                               Help = H2
   BUSY = †BUSY\CR\LF†                                   Paneled = NO
   NOCARRIER = †NO CARRIER\CR\LF†                           o
   NODIALTONE = †NO DIALTONE\CR\LF†                         o
   NOANSWER = †NO ANSWER\CR\LF†                             o
   VOICE = †VOICE\CR\LF†                                    o
   RING = †RING\CR\LF†                                   [Ring]
                                                         Display = D26
 [ADLCMAC_nif]                                           Type = QUOTEDSTRING
   DRIVERNAME = ADLCMAC$                                 StrLength = 255
   PORTNAME = †COM1†                                     Default = †RING\CR\LF†
   PCMCIA = †NO†                                         Optional = NO
   RX_FIFO_SIZE = 8                                      Help = H26
   TX_FIFO_SIZE = 8                                      Paneled = No
```

Figure 53. NETWORK.INI, PIF File, and PROTOCOL.INI Relationship

The IBM7855.PIF file also identifies the NIF file to be used, that is ADLCMAC.NIF as illustrated in Figure 54 on page 58.

```
IBM7855.PIF

[IBM7855]
DLL = ACSVPCM
ENTRY = StartVPCM
PCMCIA = NO
NIF = ADLCMAC.NIF

[DialogType]
     o o o  As above
```

Note:

The ADLCMAC_nif statement is added to PROTOCOL.INI. The statement represent the MAC driver parameters taken from the NIF file, that is ADLCMAC. NIF. You can see the same parameters through the LAPS configuration.

```
PROTOCOL.INI

[SDLC_SWNET]
    o o o  As above

[IBM7855]
    o o o  As above

[ADLCMAC_nif]
  DRIVERNAME = ADLCMAC$
  PORTNAME = †COM1†
  PCMCIA = †NO†
  RX_FIFO_SIZE = 8
  TX_FIFO_SIZE = 8
```

```
ADLCMAC.NIF

[ADLCMAC]
 Type       = NDIS_SNGL
 Title      = IBM COM Port..
 Version    = 1.0
 DriverName = ADLCMAC$
 NoBind     = Yes

[FILE]
 Name = COMMAC.SYS
 Path = \IBMCOM\MACS

[PORTNAME]
 Display  = †Portname†
 Type     = String
 StrLength = 16
 Default   = †COM1†
 Set       = †COM1†,†COM2†,.
 Optional = Yes
 Editable = Yes
 Help     = †Tells the MAC..

[PCMCIA]
 Display  = †Indicates if...
 Type     = String
 StrLength = 3
 Default   = †NO†
 Set       = †YES†,†NO†
 Optional = Yes
 Editable = Yes
 Help     =†Thisindicates..

[RX_FIFO_SIZE]
display = †Receive FIFO ...
type = decimal
range = 1-16
default = 8
optional = yes
editable = yes
virtual = no
help = †This parameter ...

[TX_FIFO_SIZE]
display = †Transmit FIFO ...
type = decimal
range = 1-16
default = 8
optional = yes
editable = yes
virtual = no
help = †This parameter ...
```

Figure 54. PIF File, NIF File and PROTOCOL.INI Relationship

Now let’s see how the PCM communicates with the modem. As described earlier, the PCM uses the DDF file to determine the actions and responses it should use for that particular type of modem. Below is an example of the dialog for an asynchronous connection using an IBM 7855 modem.

```
ATCMD.DDF

[DIALOG ENTRY]
Dialog = Initialize,  InitDelayCommand
Dialog = InitNoInc,   InitNoIncDelayCommand
Dialog = Originate,   DialCommand
Dialog = Ring,        RingCommand
Dialog = Answer,      AnswerCommand
Dialog = Hangup,      HangupDelayCommand
                                                  2
[ACTION GROUP]
Name = InitDelayCommand
Action = StartTimer, 1
Action = WaitForResponse, InitDelayResponse

[RESPONSE GROUP]               3
Name = InitDelayResponse
Response = Timeout, Init1Command

[ACTION GROUP]            4
Name = Init1Command                        5
Action = SendString, Initialization1
Action = StartTimer, 10
Action = WaitForResponse, Init1Response

[RESPONSE GROUP]
Name = Init1Response
Response = ReceiveString, Success,   Init2Command
Response = ReceiveString, Failure,   Init2Command
Response = ReceiveString, NoCarrier,InitDelayCommand
Response = Timeout, NoResponseExit

[ACTION GROUP]
Name = Init2Command
Action = SendString, Initialization2
Action = StartTimer, 10
Action = WaitForResponse, Init2Response

      o
      o
      o

[ACTION GROUP]
Name = ForbiddenExit
Action = ExitDialog, Forbidden
```

```
     PROTOCOL.INI

1    [IBM7855]
     DIALOGTYPE = †ATCMD.DDF†
     SYNCHRONICITY = †Asynchronous†
     PORTNAME = COM1
     ACCPTINCCALL = †NO†
     MODEMCLASS = †V.32†
     SERIALPORTSPEED = 19200
     AUTOBAUDDETECT = †Off†
     FLOWCONTROL = †RTS/CTS†
     PERMCONNECTION = NO
     CFGTYPE = Locked
     INITIALIZATION1 = †ATI3\CR†
     INITIALIZATION2 = †ATE1Q0V1X4S...
     INITIALIZATION3 = †ATE1Q0V1X4S...
     DIALPREFIX = †ATDT†
     DIALSUFFIX = †\CR†
     SUCCESS = †OK\CR\LF†
     FAILURE = †ERROR\CR\LF†
     CONNECTPREFIX = †CONNECT†
     CONNECTSUFFIX = †\CR\LF†
     ESCAPE = †+++†
     HANGUP = †ATH\CR†
     RINGBACK = †RING\CR\LF†
     BUSY = †BUSY\CR\LF†
     NOCARRIER = †NO CARRIER\CR\LF†
     NODIALTONE = †NO DIALTONE\CR\LF†
     NOANSWER = †NO ANSWER\CR\LF†
     VOICE = †VOICE\CR\LF†
     RING = †RING\CR\LF†

       o    o    o
```

Figure 55. DDF File and PROTOCOL.INI Relationship

In the figure above is shown, on the left, a small portion of the ATCMD.DDF file, and on the right, part of the PROTOCOL.INI file showing the PCM configuration data for an IBM7855 PCM.

In 1 , the PCM configuration data identifies which DDF file should be used. So, when the PCM needs to communicate with the modem, it would look for this DDF file, and start executing the commands contained in this file.

In this case, the first instruction indicates that it should start a dialog called Initialize, and execute an action called InitDelayCommand. The PCM starts looking in to the DDF file for an action called InitDelayCommand (in 2) and finds this as the next entry in the DDF file.

This action instructs it to start a timer for a timer unit of 1, and then to wait for a response identified as InitDelayResponse. It looks for a response by that name (3 , which is identified next and causes it to execute the next command called Init1Command (4).

This action is to send a string called Initialization1 to the modem. In order to find out what the string should contain, the PCM will search its configuration data (5) to find out what this string should be; in this case, the value is ″ATI3CR″.

There is no need to describe the rest of the DDF file. As was illustrated by the above example, the DDF file instructions, combined with the configuration data for this PCM, will drive a sequence of commands and responses to be exchanges with the modem in order to first initialize it, and then get it to dial a number, get a connection and send data.

Notice the flow marked with 1 , 2 , etc. showing the dialog between the PCM, using a DDF file, and the modem.

3.3 Standard COM Port and IRQ Level Definition

Shown below is the standard COM port, IRQ level and base address that should be used in an SNA Phone Connect configuration:

Port	COM1	COM2	COM3	COM4	COM5	COM6	COM7	COM8
IRQ Level	4	3	3	3	3	3	3	3
Base Address	03F8	02F8	3220	3228	4220	4228	5220	5228

The base address, or so called I/O port address, can be found in the specification for the adapter card. The port address must be unique for each COM port.

In an AT-bus machine, the IRQ level must be chosen in such a way that it does not conflict with another adapter card in the system, since AT-bus machines cannot share an IRQ level.

Refer to your workstation technical reference manual on how to set up the port, IRQ level and base address.

3.4 Latest MPA Level

Synchronous SNA Phone Connection requires the latest MPA card with the card assembly number 92F1344. The card assembly number is typically on a small white label on the back of the adapter (solder side), usually along the top edge of the card, for example: “*92F1334*C 3241.” The first seven characters are the card assembly number.

The following table lists the MPA levels and what they support.

Table 2 (Page 1 of 2). MPA Adapter Card Levels

Part Number	FRU	Card assembly	Description
6451114	85F0004	92F1344	Supports synchronous autodial. Works on PS/2 for asynchronous and synchronous connections.
6451003	90X8995	90X8460	Supports asynchronous autodial. Works on PS/2 for asynchronous only.

Table 2 (Page 2 of 2). MPA Adapter Card Levels

Part Number	FRU	Card assembly	Description
6450348	90X6771		Does not support SNA Phone Connections. Works on PS/2 with a clock speed of 16 MHz or less and the location identified as ZM1 on the card, near the cable connector, is not populated with a chip.

Chapter 4. Configuration Example - Synchronous to a 3745 Using an MPA Adapter

This scenario describes the configuration setup for 3270 emulation using an MPA adapter and an SNA Phone Connect synchronous switched connection to a 3745 Communications Controller.

This setup is illustrated in Figure 56.

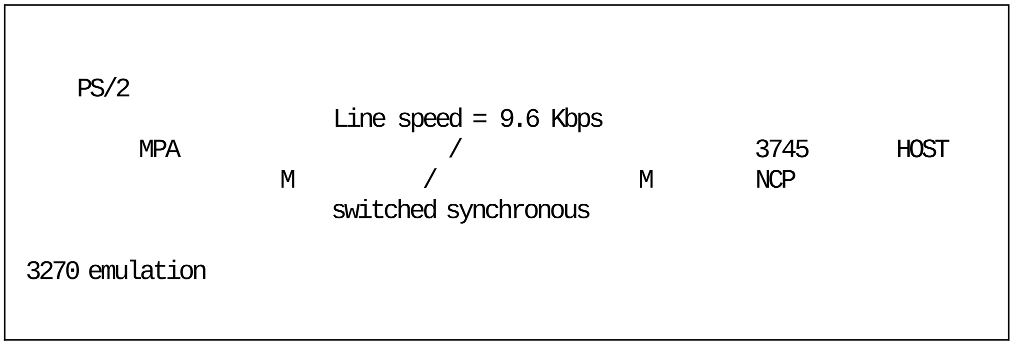


Figure 56. 3270 Emulation - Synchronous Switched SNA Phone Connect to a 3745

The equipment used is as follows:

- PS/2 Model 95 with an IBM MPA adapter
- A pair of IBM 7855 Model 10 modems
- 3745 Model 170

Note

This chapter only explains the CM/2 configuration process for a specific scenario. Refer to Chapter 1, “SNA Phone Connect Overview” on page 1 and Chapter 2, “CM/2 SNA Phone Connect Configuration” on page 11 for more general configuration information. Make sure that you have installed LAPS level WR07020 or above before configuring SNA Phone Connect.

Modem Setup

In this scenario, since we are using the modem in synchronous mode, we have reset it to factory defaults (synchronous mode with speed of 9.6 Kbps) by using the switches on the modem′s front panel. For more information on operation of the IBM 7855 Model 10 modem, refer to the product documentation.

4.1 CM/2 Configuration Process

1. Start the Communications Manager Setup and select **Setup**. Select the configuration file name that will be used, or create a new one, for example, “MPA3745,” as used in this scenario. Then continue to the Communications Manager Configuration Definition window.

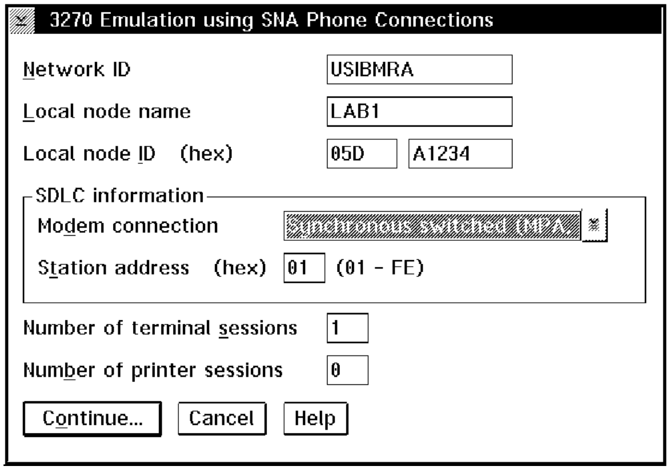
© Copyright IBM Corp. 1995

Note

If you are updating an existing configuration file, the sequence of windows that you see may differ from what is shown here. This scenario assumes you are creating a new configuration file.

As well, if the radio button in the Definitions Selection box is set to “Additional Definitions,” set it to “Commonly Used Definitions” in order to get a list of commonly used definitions to choose from.

2. From the list of commonly used definitions, select 3270 Emulation using SNA Phone Connections, and then click on **Configure** to get the window shown below (which is the first of two windows used by the quick configuration process) and enter the required fields as shown:



3270 Emulation using SNA Phone Connections

Network ID: USIBMRA
Local node name: LAB1
Local node ID (hex): 05D A1234
SDLC information
Modem connection: Synchronous switched (MPA
Station address (hex): 01 (01 - FE)
Number of terminal sessions: 1
Number of printer sessions: 0

Figure 57. 3270 Emulation Using SNA Phone Connections

- **Network ID**

  In this scenario it can be any name you like, although this is usually provided to you by your network administrator since each organization has naming conventions that need to be followed.

- **Local node name**

  The local node name is your Control Point LU name, but in this scenario, it can be anything you like since we will not be using this LU as an APPC LU.

- **Local node ID (hex)**

  This value should match the IDBLK/IDNUM on the host NCP configuration definition, which in this scenario was 05D A1234.

- **SDLC information**

  – Modem connection

    Select **Synchronous switched (MPA, WAC, OEM)** from the list box.

  – Station address (hex)

    In this scenario the station address can be any value, since it is a switched connection.

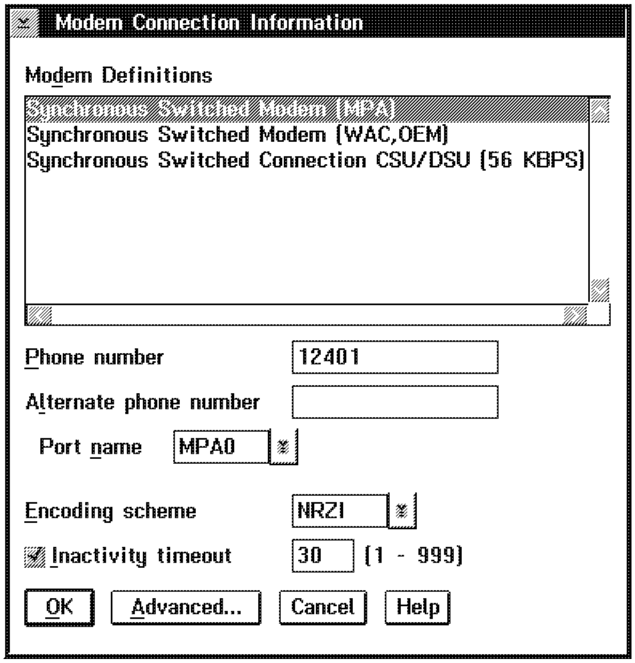
- **Number of terminal sessions**

Can be any number from 0 to 26, however the total number of terminal and printer sessions cannot be more than 26.

- **Number of printer sessions**

  Can be any number from 0 to 26, however the total number of terminal and printer sessions cannot be more than 26.

3. Select **Continue** to get the second quick configuration window, called the Modem COnnection Information, as displayed below:


Modem Connection Information
Modem Definitions
Synchronous Switched Modem (MPA)
Synchronous Switched Modem (WAC,OEM)
Synchronous Switched Connection CSU/DSU (56 KBPS)
OK
Advanced...
Cancel
Help

Phone number: 12401

Alternate phone number:

Port name: MPA0

Encoding scheme: NRZI

☑ Inactivity timeout: 30 (1 - 999)

Figure 58. Modem Connection Information

- **Modem Definitions**

  In this scenario Synchronous Switched Modem (MPA) is used.

- **Phone number**

  Enter the telephone number required to dial to the 3745. The format to use here is the same as if you were manually dialing this number. It is highly dependent on your environment. In this example, we were making an internal call, through our own internal switch, so we were only required to add a 1 in front of the 4 digit extension (2401).

- **Alternate phone number**

  This is optional. It is the number that will be dialed when the primary number is busy or not available.

- **Port name**

  The default value is MPA0. The only other value that can be used is MPA1. However if you are using only one MPA card, using MPA0 is recommended. Make sure that the card is configured as SDLC 1 for MPA0. To configure the card, use the reference diskette for your workstation.

- **Encoding scheme**

NRZI is used in this scenario since NRZI was defined in the NCP configuration.

The default encoding scheme in an NCP configuration is NRZI. It is recommended to use NRZI, since NRZI is a better encoding scheme than NRZ to avoid the loss of clock synchronization between modems for extended sequence of zero-bits data.

- **Inactivity timeout**

  Do not select Inactivity timeout unless it is required.

  When the Inactivity timeout field is selected a number (representing minutes) should be entered between 1 - 999. The inactivity timeout limits the amount of time a link can be unused or idle before it is automatically disconnected. For example, if you set the timeout to 30, then the link will be automatically disconnected when 30 minutes have elapsed without any data traffic on the link.

Select **OK** to end the configuration.

At this point, if this is the first time that this is configured, there may be installation activity taking place as a result of this new configuration. You will need to reboot the workstation because there will have been updates to CONFIG.SYS as well as PROTOCOL.INI, in addition to additional components being installed in CMLIB.

4.2 Related Files

In this section, we illustrate some changes and additions that have been made, by this configuration, to some of the system files. This may be handy if you need to verify that your configuration was indeed successful and produced the same results as ours.

4.2.1 CONFIG.SYS

This configuration will add the following lines to CONFIG.SYS, if they were not already present. They are the OS/2 device driver for the MPA adapter, the SDLC protocol driver and the virtual MAC device driver.

```
DEVICE=E:\CMLIB\SDLCSNET.OS2
DEVICE=E:\CMLIB\SDLCVMAC.SYS
DEVICE=E:\CMLIB\CMKFMDE.SYS
DEVICE=E:\IBMCOM\MACS\MPADD.SYS
```

4.2.2 PROTOCOL.INI

In PROTOCOL.INI, you should see an entry for the SYNCSW Port Connection Manager, along with an entry for the MPA MAC driver (MPADD_NIF) and the SDLC protocol driver for a switched network (SDLC_SWNET).

```
[SYNCSW]

    DIALOGTYPE = †V25BIS.DDF†
    SYNCHRONICITY = †Synchronous†
    PORTNAME = MPA0
    ACCPTINCCALL = †NO†
    PERMCONNECTION = NO
    ENCODINGSCHEME = †NRZI†
    CALLREQUEST = †CRN†
    VALID = †VAL†
    INVALID = †INV†
    CONNECT = †CNX†
    INCOMINGCALL = †INC†
    DELAYEDCALL = †DLC†
    ABORTCALL = †CFIAB†
    ABORTCALLB = †CFI AB†
    MODEMBUSY = †CFICB†
    MODEMBUSYB = †CFI CB†
    ENGAGEDTONE = †CFIET†
    ENGAGEDTONEB = †CFI ET†
    FORBIDDENCALL = †CFIFC†
    FORBIDDENCALLB = †CFI FC†
    NOANSWERTONE = †CFINT†
    NOANSWERTONEB = †CFI NT†
    RINGTONE = †CFIRT†
    RINGTONEB = †CFI RT†
    DIALTONEERROR = †CFIDE†
    DIALTONEERRORB = †CFI DE†
    QUERY = †RLI†
    CFGTYPE = Locked

[SDLC_SwNET]

    DRIVERNAME = SDLCSNET
    BINDINGS = SDLCVMAC0, SDLCVMAC1
    CFGTYPE = Locked

[MPADD_nif]

    DRIVERNAME = MPAMAC$
    PORTNAME = †MPA0†
    LINE_MODE = †FULL_DUPLEX†
```

4.2.3 NETWORK.INI

In NETWORK.INI, the autostart parameter for the Synchronous Switched Modem (MPA) entry should have been set to YES.

```
DLL = ACSVSPCM
ENTRY = StartVPCM
PIF = SYNCSW.PIF
PCMNAME = SYNCSW
AUTOSTART = YES
TITLE = Synchronous Switched Modem (MPA)
```

4.2.4 Example of Host Parameters Used for This Scenario (3745)

This is for information purposes mainly, and it shows some of the host definitions that were used for this scenario.

```
GROUPSW  GROUP LNCTL=SDLC,
         DIAL=YES,
         NEWSYNC=NO,
         NRZI=YES,
         PAUSE=1,
         RETRIES=(7,4,5)
DIALA    LINE ADDRESS=(26,HALF),
         NPACOLL=YES,
                OWNER=RAK,
                CLOCKNG=EXT,
                DUPLEX=HALF,
                RETRIES=(5,10,3),
                SPEED=2400,
                ANSWER=ON,
                CALL=INOUT,
                ISTATUS=ACTIVE

      HCTR1000  PU ADDR=01,IDBLK=05D,PUTYPE=2,IDNUM=A1234,
                   CPNAME=HCXP1000,MODETAB=MT3278SD,DLOGMOD=T3278GD,
                   SSCPFM=USSSCS,ANS=CONT,
                   ISTATUS=ACTIVE,USSTAB=USSTBSTD,
                   MAXDATA=1033,MAXOUT=7,PACING=2,VPACING=8
      HWSV0000  LU LOCADDR=2                                3270
      HWSA0000  LU LOCADDR=3                                3270
      HWSB0000  LU LOCADDR=4                                3270
      HWSC0000  LU LOCADDR=5                                3270
      HWSP0000  LU LOCADDR=6,DLOGMOD=DSC2K,LOGAPPL=         PRINTER
```

Note

The NCP parameter SPEED=2400, is used for lines with an internal clock and to calculate the weight of the LIC used. It also is used for problem determination Wrap Tests, in which case it should match the clock speed of the modem, but for all other operational aspects the modem clock will determine the speed used.

Chapter 5. Configuration Example - Synchronous to a 3745 Using a WAC Adapter

This scenario describes the configuration setup for 3270 emulation using a WAC adapter and an SNA Phone Connect synchronous leased connection to a 3745 communications controller.

The WAC adapter, available as a Micro Channel or ISA card, supports the following interfaces:

- RS232/V.24 for data transfer rates up to 19.2 Kbps
- RS422/449 for data transfer rates up to 1.544 Mbps
- V.35 for data transfer rates up to 2.048 Mbps
- X.21 for data transfer rates up to 2.048 Mbps

While physical interfaces support data transfer rates up to 2.048 Mbps, SNA Phone Connect only supports speeds up to 64 Kbps.

The electrical interface for each communication link is contained on an Electrical Interface Board (EIB), which plugs into the main WAC board.

You can use up to two ports or adapters, including both ports on the IBM WAC adapter, and use the SDLC and/or the X.25 protocols for synchronous leased line connections.

To use the WAC adapter, you must have OS/2 Version 2.0 or above and LAPS level WR07020 or above.

The setup of the scenario is shown below:

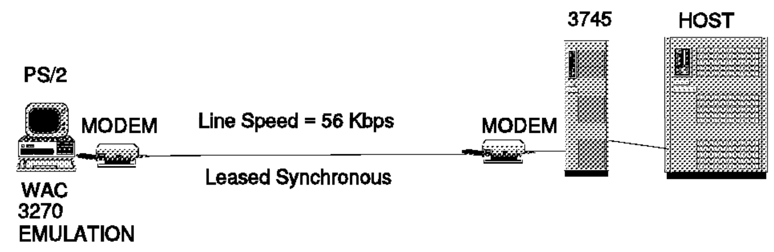


Figure 59. 3270 Emulation - Synchronous Leased Line with a WAC Adapter

The equipment used is as follows:

- PS/2 Model 95
- A pair of IBM 5822 Model 10 modems
- 3745 Model 170
- A WAC adapter

© Copyright IBM Corp. 1995

Note

This chapter only explains the CM/2 configuration process for a specific scenario. Refer to Chapter 1, “SNA Phone Connect Overview” on page 1 and Chapter 2, “CM/2 SNA Phone Connect Configuration” on page 11 for more general configuration information. Make sure that you have installed LAPS level WR07020 or above before configuring SNA Phone Connect.

Note

In this scenario, if you are planning to test the modems back to back before you try them on a real link, you must use analog inverted cables. Do not use the cables that come with the modems because they are not inverted cables. The line between the modems must connect Tx to Rx and Rx to Tx in order for this to work as shown below:

```
                     ANALOG INVERTED CABLE


 ___________                                     ___________
| RJ - 45   |Tx_____________________________Rx| RJ - 45   |
|           |Tx_____________________________Rx|           |
| CONNECTOR |                                 | CONNECTOR |
|           |                                 |           |
|           |Rx_____________________________Tx|           |
|___________|Rx_____________________________Tx|___________|
```

5.1 LAPS Configuration Process

This is a case where you need to use the LAPS configuration process, because the WAC MAC is neither supplied nor automatically configured by CM/2 when you configure the PCM.

Using the diskette that came with WAC adapter, you need to:

Important

Make sure that the level of the code you get on the WAC adapter diskette is Version 2.0 or above.

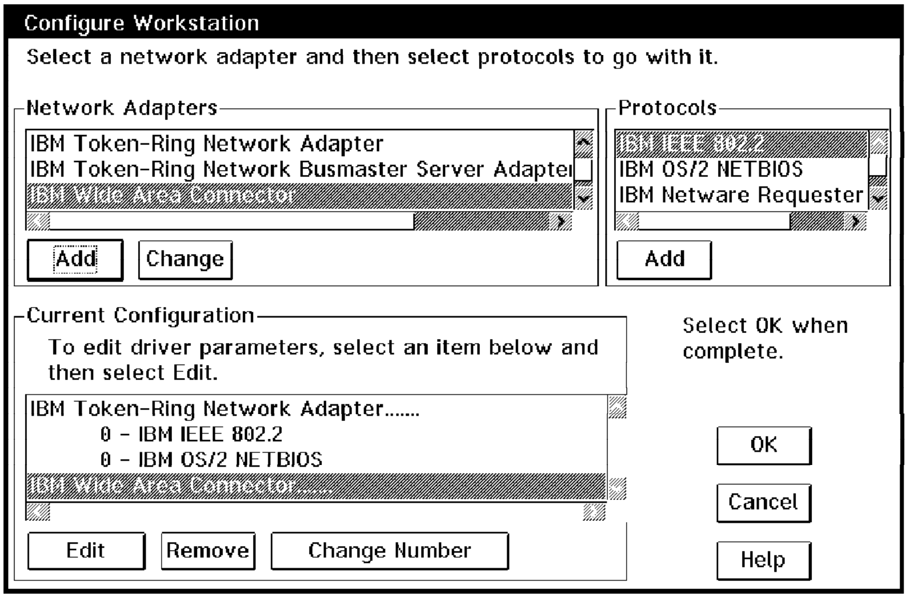
From an OS/2 command prompt, type:

```
x:\IBMCOM\LAPS
where : †x† is the drive where LAPS was installed.
```

Select ″Install″ and insert the diskette driver Version 2.0 or later that came with the IBM WAC adapter and specify A:OS2 for the source drive, as shown here:

```
A:\OS2
```

This copies IBMWAC.NIF and IBMWAC.OS2 to the IBMCOM\MACS subdirectory. When you get the completion message, select OK, then select **Configure** to get the following window.


Configure Workstation

Select a network adapter and then select protocols to go with it.

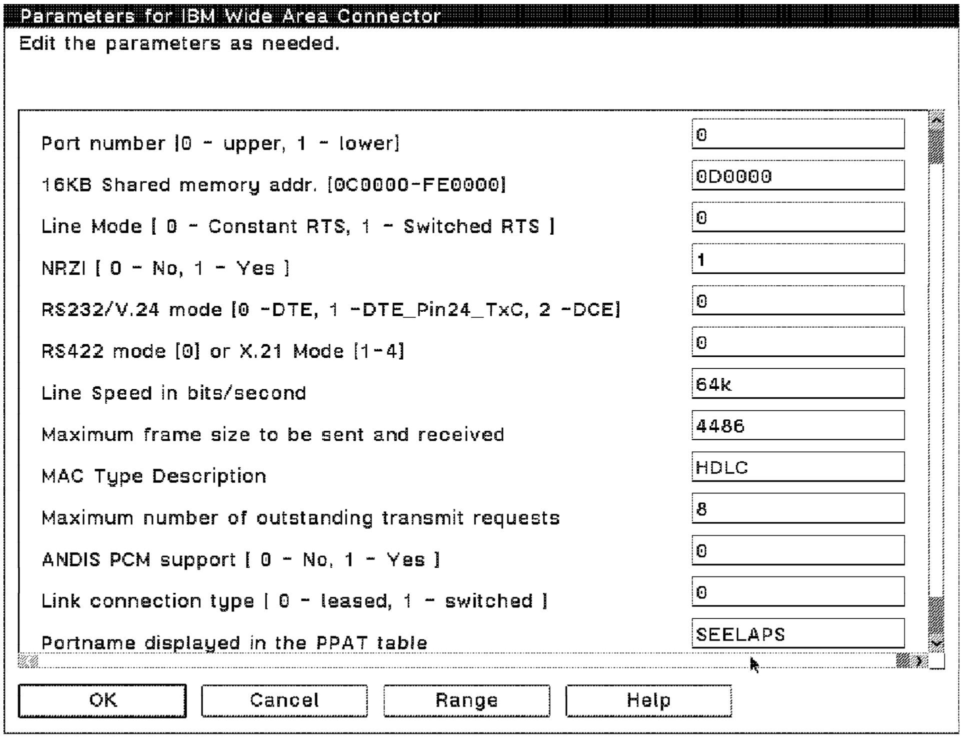
To edit driver parameters, select an item below and then select Edit.

Select OK when complete.

Figure 60. Configuring LAN Transports for WAC Adapter

Select the IBM Wide Area Connector in the Network Adapters list (which you just installed) and click on **Add**.

An entry labeled IBM Wide Area Connector will appear in the Current Configuration list. Select it and **Edit** to get the following panel:



Parameters for IBM Wide Area Connector

Edit the parameters as needed.

Port number [0 - upper, 1 - lower]	0
16KB Shared memory addr. [0C0000-FE0000]	0D0000
Line Mode [0 - Constant RTS, 1 - Switched RTS]	0
NRZI [0 - No, 1 - Yes]	1
RS232/V.24 mode [0 -DTE, 1 -DTE_Pin24_TxC, 2 -DCE]	0
RS422 mode [0] or X.21 Mode [1-4]	0
Line Speed in bits/second	64k
Maximum frame size to be sent and received	4486
MAC Type Description	HDLC
Maximum number of outstanding transmit requests	8
ANDIS PCM support [0 - No, 1 - Yes]	0
Link connection type [0 - leased, 1 - switched]	0
Portname displayed in the PPAT table	SEELAPS

Figure 61. Parameters for IBM WAC Adapter

- **Slot number**

  Identifies the slot where the IBM WAC adapter is inserted in for a Micro Channel workstation. For AT/ISA bus workstations, this is a hex representation of the dip switches on the adapter. If you are using an AT/ISA bus workstation, refer to the WAC documentation for instructions on how to set all the dip switches on the adapter.

- **Port number**

  The port number identifies which of the two ports on the IBM WAC adapter this MAC is being configured for. The upper port is the one farthest from the system board; the lower port is the one closest to the system board.

Note

When you order the WAC adapter, you choose a single electrical interface that comes with the adapter, either RS-232D, CCITT V.35, CCITT X.21, or RS-422/449. To add a second interface to the WAC adapter, you need to order an additional ″Wide Area Connector element″ as follows:

Description	Part Number
RS-232D	33G8461
CCITT V.35	33G8462
CCITT X.21	33G8463
RS 422/449	33G8464

The above part numbers represent an interface board and cable that attaches to the WAC adapter to enable the second port. Note that the part number for the second port is the same for both the ISA and the MCA WAC adapter.

- **16KB Shared memory addr**

  Specify the starting address for the 16KB shared memory on the card. This address is required for ISA bus only, as it is set up automatically in POS registers for the Micro Channel card. The address is only required for the definition of port 0 of each card. The address must be on a 16KB (x′4000′) boundary.

Note

To install more than one WAC adapter for the ISA adapter, the I/O address range must be different for each adapter in the system. For the Micro Channel adapter, since each WAC adapter uses a 16KB window of memory, different I/O address ranges are automatically assigned for each WAC adapter installed in the system. Therefore, no manual adjustments of the configuration parameters are required for this implementation.

- **Line mode**

  Specifies whether half-duplex or full-duplex transmission facilities are being used. The parameter should be set to Switched RTS if either half-duplex communications facilities are being used, or the line is a secondary end of a multidrop SDLC line. Constant RTS should be specified for full-duplex communications facilities, point-to-point lines and for the primary end of SDLC lines.

- **NRZI**

  NRZI is used in this scenario since NRZI was defined in the NCP configuration.

  The default encoding scheme in an NCP configuration is NRZI. It is recommended to use NRZI, since NRZI is a better encoding scheme than NRZ to avoid the loss of clock synchronization between modems for extended sequence of zero-bits data. This value is overridden by the value specified in the PCM configuration.

- **RS232/V.24 mode**

  Specifies clocking modes if the RS232/V.24 card is installed. Specify 0 for DTE mode when connected to a modem that generates the clocking. Specify 1 when connected to a modem that requires the DTE to generate Tx clock on pin 24. Specify 2 to run in DCE mode where the WAC provides both Rx and Tx clocks. DCE mode requires the use of a crossover adapter described in the Technical Reference Manual.

- **RS422 mode**

  Specifies clocking modes if the RS422/X.21 card is installed. Specify 0 for RS422 DTE modem (this requires the RS422 cable). Specify 3 for normal X.21 DTE mode. Specify 4 for X.21 DTE TxC_Echo mode (clock received on the S line is echoed on the B line to eliminate Tx clocking skew on long cables). Options 1 and 2 are for X.21 DCE mode and require a crossover connector as described in the Technical Reference Manual. Specify 2 for normal X.21 DCE mode. Specify 1 for X.21 DCE TxC_Echo (the attached DTE must echo the clock back on the B line to be used for clocking data into the Wide Area Connector).

- **Line Speed in bits/second**

  Specifies the clock speed to be used when the port generates the clocking signal. When in normal DTE mode, the clocking is generated by the modem or DSU/CSU, and this parameter is ignored.

  The port generates clocking in all DCE modes, and in RS232/V.24 24-pin mode.

  The maximum line speed supported for SNA Phone Connect is 64 Kbps.

  This value is overridden by the value specified in the PCM configuration.

- **Maximum frame size to be sent or received**

  Specifies the maximum size data frame that can be processed, and is used by the MAC driver to allocate buffers.

- **MAC Type description**

  Specifies the MAC type that is visible to the higher layer protocol drivers. These protocols may refuse to BIND to the MAC if MAC Type does not conform to their requirements. The Wide Area Connector saves this parameter, but does nothing with it.

- **Maximum number of outstanding transmit requests**

  Allocates buffers for the specified number of transmit requests. Transmit requests greater than this number must be retried by the higher layers (but this is normally correct operation). If the protocol window size in known, the allocation value should be that number plus one. If the number cannot be determined, use the default for most situations.

- **ANDIS PCM support**

  Make sure this parameter is set to 1 (yes) when the IBM WAC adapter is used with SNA Phone Connect.

- **Link connection type**

  Specify 0 if you are using leased lines or specify 1 if you are using switched lines. This value is overridden by the value specified in the PCM configuration.

- **Portname displayed in the PPAT table**

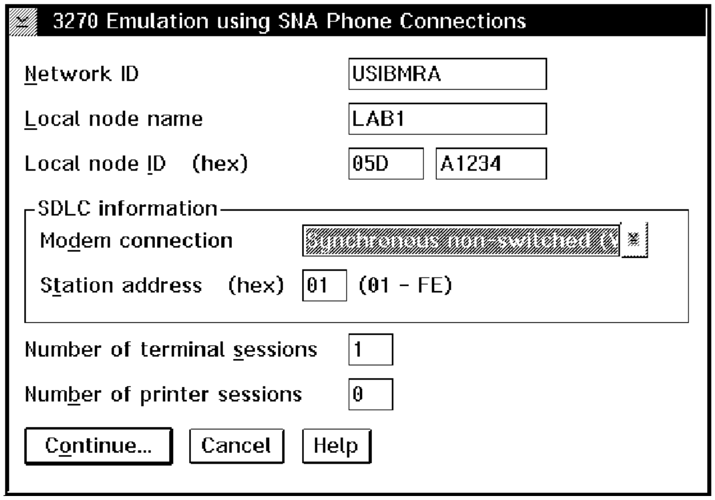
  Identifies this MAC to the port connection manager. This name MUST match the port name defined in the PCM configuration, as shown in Figure 63 on page 76, where we have used the name SEELAPS.

5.2 CM/2 Configuration Process

1. Start the Communications Manager Setup and select **Setup**. Select the configuration file name that will be used, or create a new one, for example, "WAC3745," was used in this scenario. Then continue to the Communications Manager Configuration Definition window.

> **Note**
>
> If you are updating an existing configuration file the sequence of windows that you see may differ from what is shown here. This scenario assumes you are creating a new configuration file.
>
> As well, if the radio button in the Definitions Selection box is set to "Additional Definitions," set it to "Commonly Used Definitions" in order to get a list of commonly used definitions to choose from.

2. From the list of commonly used definitions, select 3270 Emulation using SNA Phone Connections, and then click on **Configure** to get the window shown below (which is the first of two windows used by the quick configuration process) and enter the required fields as shown:



Network ID: USIBMRA
Local node name: LAB1
Local node ID (hex): 05D A1234
Modem connection: Synchronous non-switched (v
Station address (hex): 01 (01 - FE)
Number of terminal sessions: 1
Number of printer sessions: 0

Figure 62. 3270 Emulation Using SNA Phone Connections

- **Network ID**

  In this scenario it can be any name you like, although this is usually provided to you by your network administrator since most organizations have naming conventions that need to be followed.

- **Local node name**

  The local node name is your Control Point LU name, but in this scenario, it can be anything you like since we will not be using this LU as an APPC LU.

- **Local node ID (hex)**

  This value should match the IDBLK/IDNUM on the host NCP configuration definition, which in this scenario was 05D A1234.

- **SDLC information**

  – Modem connection

  Select **Synchronous leased (WAC/OEM)** from the list box.

  – Station address (hex)

    In this scenario the station address must match the host definition because this is a leased line (no dial).

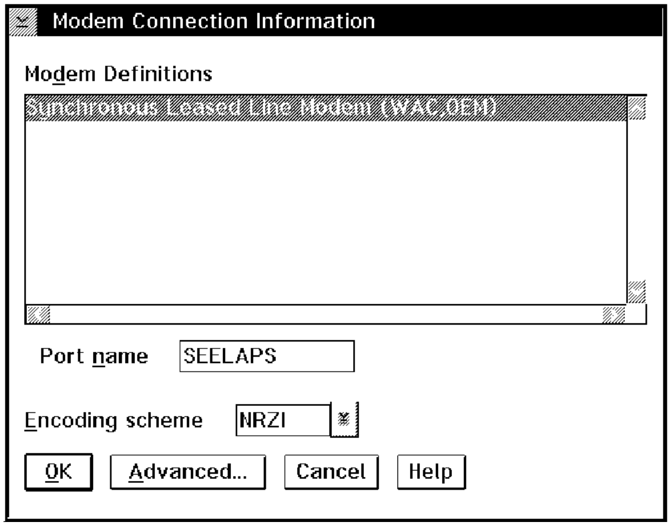
- **Number of terminal sessions**

  Can be any number from 0 to 26, however the total number of terminal and printer sessions cannot be more than 26.

- **Number of printer sessions**

  Can be any number from 0 to 26, however the total number of terminal and printer sessions cannot be more than 26.

3. Select **Continue** to get the second quick configuration window, as shown below:



Modem Connection Information

Modem Definitions: Synchronous Leased Line Modem (WAC,OEM)

Port name: SEELAPS

Encoding scheme: NRZI

Figure 63. Modem Connection Information

- **Modem Definitions**

  In this scenario Synchronous Leased Line Modem (WAC,OEM) is used.

- **Port name**

  The Port name identifies the MAC for the communications hardware port you are using. The value entered here MUST match the value that was used when this MAC was configured in LAPS. In this example, we used the value SEELAPS, as shown in Figure 61 on page 72.

- **Encoding scheme**

  NRZI is used in this scenario since NRZI was defined in the NCP configuration.

  The default encoding scheme in an NCP configuration is NRZI. It is recommended to use NRZI, since NRZI is a better encoding scheme than NRZ to avoid the loss of clock synchronization between modems for extended sequence of zero-bits data.

  This parameter must match the host configuration, or in other words you must define the same at both ends.

Select **OK** to end the configuration.

At this point, if this is the first time that this is configured, there may be installation activity taking place as a result of this new configuration. You will need to reboot the workstation because there will have been updates to CONFIG.SYS as well as PROTOCOL.INI, in addition to additional components being installed in CMLIB.

5.3 Related Files

In this section, we illustrate some changes and additions that have been made, by this configuration, to some of the system files. This may be handy if you need to verify that your configuration was indeed successful and produced the same results as ours.

5.3.1 CONFIG.SYS

This configuration will add the following lines to CONFIG.SYS, if they were not already present. They are the OS/2 device driver for the WAC adapter, the SDLC protocol driver and the virtual MAC device driver.

```
DEVICE=E:\IBMCOM\MACS\IBMWAC.OS2
DEVICE=E:\CMLIB\SDLCSNET.OS2
DEVICE=E:\CMLIB\SDLCVMAC.SYS
DEVICE=E:\CMLIB\CMKFMDE.SYS
```

5.3.2 PROTOCOL.INI

In PROTOCOL.INI, you should see an entry for the SYNCLLO Port Connection Manager (Synchronous Leased Line Only), along with an entry for the WAC MAC driver (IBMWAC_NIF) and the SDLC protocol driver for a switched network (SDLC_SWNET).

Note: LAPS will prompt the user to reboot after installation of the WAC MAC, but it is not necessary to reboot at that time.

```
[SYNCLLO]

   DIALOGTYPE = †NODIALOG.DDF†
   SYNCHRONICITY = †Synchronous†
   PORTNAME = SEELAPS
   PERMCONNECTION = YES
   PHONENUMBER = †PERM_SEELAPS†
   ENCODINGSCHEME = †NRZI†
   CFGTYPE = Locked

[SDLC_SWNET]

   DRIVERNAME = SDLCSNET
   BINDINGS = SDLCVMAC0, SDLCVMAC1
   CFGTYPE = Locked

[IBMWAC_nif]

    DriverName = IBMWAC$
    WACCARDNUM = 7
    WACPORTNUM = 0
    RAMADDRESS = 0x0D0000
    RTS = 0
    NRZI = 1
    RS232MODE = 0
```

```
X21MODE = 0
LINESPEED = †64k†
MAXDATA = 4486
MACTYPE = †HDLC†
MAXTRANSMITS = 8
PCMSUPPORT = 1
CONNTYPE = 0
PORTNAME = †SEELAPS†
FLAGS = 1
```

5.3.3 NETWORK.INI

In NETWORK.INI, the autostart parameter for the SYNCLLOEM entry should have been set to YES.

```
DLL = ACSVSPCM
ENTRY = StartVPCM
PIF = SYNCLLO.PIF
PCMNAME = SYNCLLOEM
AUTOSTART = YES
TITLE = Synchronous Leased Line Modem (WAC,OEM)
```

5.3.4 Example of Host Parameters Used for This Scenario (3745)

This is for information purposes mainly, and shows some of the host definitions that were used. It is an example of NCP generation used for this scenario. The parameters highlighted are important for establishing the initial communication between the 3745 and the workstation.

```
 GROUPSW  GROUP LNCTL=SDLC,
          DIAL=NO,
          NEWSYNC=NO,
          NRZI=YES,
          PAUSE=1,
          RETRIES=(7,4,5)
 LINE     LINE ADDRESS=(225,FULL),
          NPACOLL=YES,
          OWNER=RAK,
          CLOCKNG=EXT,
          DUPLEX=FULL,
          RETRIES=(5,10,3),
          SPEED=64000,
          ANSWER=ON,
          ISTATUS=ACTIVE

HCTR1000  PU ADDR=01,
            IDBLK=05D,PUTYPE=2,IDNUM=A1234,
            CPNAME=HCXP1000,MODETAB=MT3278SD,DLOGMOD=T3278GD,
            MAXDATA=1033,MAXOUT=7,PACING=2,VPACING=8
HWSV0000  LU LOCADDR=2                                   3270
HWSA0000  LU LOCADDR=3                                   3270
HWSB0000  LU LOCADDR=4                                   3270
HWSC0000  LU LOCADDR=5                                   3270
HWSP0000  LU LOCADDR=6,DLOGMOD=DSC2K,LOGAPPL=            PRINTER
```

Chapter 6. Configuration Example - Asynchronous to an AS/400

This chapter describes the configuration setup for 5250 emulation from a PS/2 to an AS/400 using a COM port and an SNA Phone Connect asynchronous switched connection (SNA over asynchronous).

The setup is shown below in Figure 64.

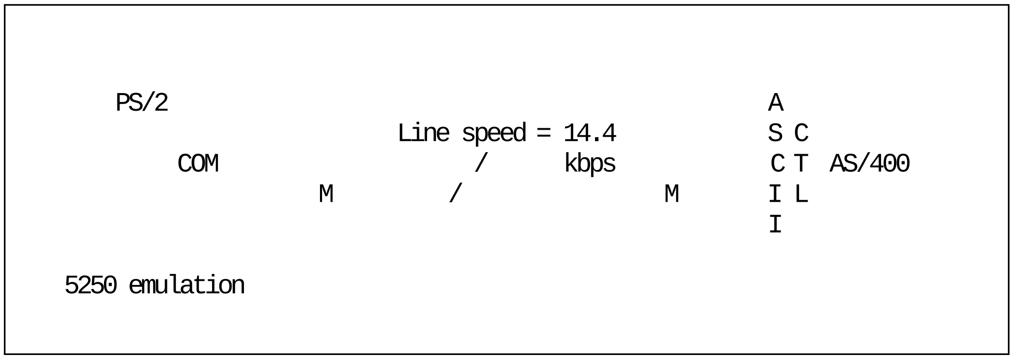


Figure 64. 5250 Emulation - Asynchronous Switched to an AS/400

The equipment used is as follows:

- PS/2 Model 80
- A pair of US Robotics Sportster 14400 modems
- AS/400 Model 9406 - F60

Note

This chapter only explains the CM/2 configuration process for a specific scenario. Refer to Chapter 1, “SNA Phone Connect Overview” on page 1 and Chapter 2, “CM/2 SNA Phone Connect Configuration” on page 11 for more general configuration information. Make sure that you have installed LAPS level WR07020 or above before configuring SNA Phone Connect.

6.1 CM/2 Configuration Process

1. Start the Communications Manager Setup. The Communications Manager Setup can be started from the icon in the Communications Manager folder or from the OS/2 command line. To start from the OS/2 command line type `CMSETUP`.
2. Then select **Setup** to go to the next window. Select the configuration file name that will be used, or create a new one.

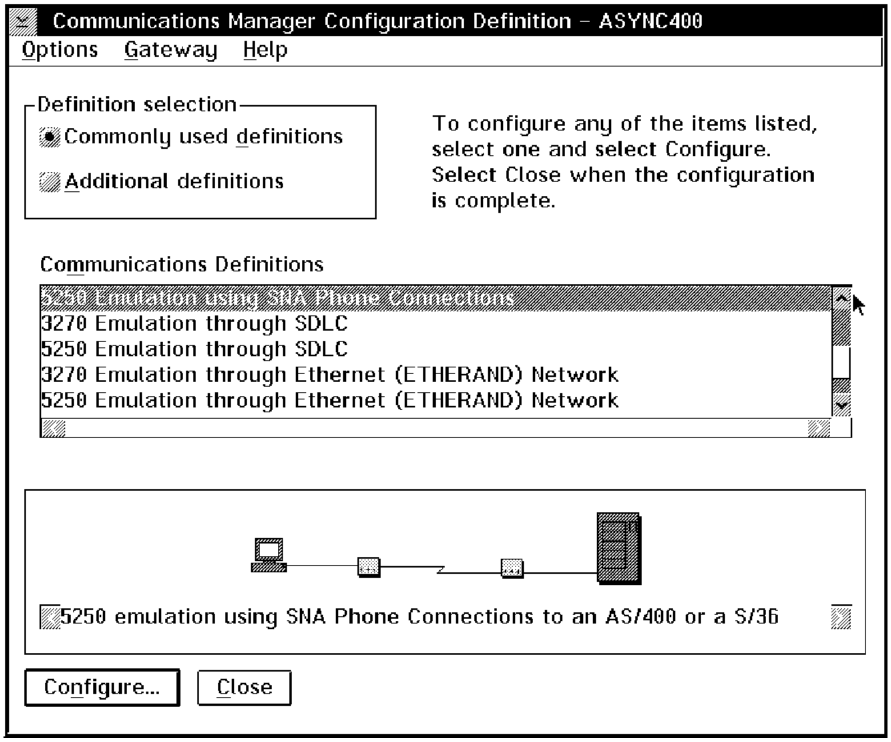
   To create the new configuration file, enter its name, for example, `ASYNC400`, as used in this scenario.

© Copyright IBM Corp. 1995

Note

If you are updating an existing configuration file the sequence of windows that you see may differ from what is shown here. This scenario assumes you are creating a new configuration file.

As well, if the radio button in the Definitions Selection box is set to “Additional Definitions,” set it to “Commonly Used Definitions” in order to get a list of commonly used definitions to choose from, as shown below.


Communications Manager Configuration Definition - ASYNC400
Options Gateway Help
Definition selection
● Commonly used definitions
○ Additional definitions

To configure any of the items listed, select one and select Configure. Select Close when the configuration is complete.

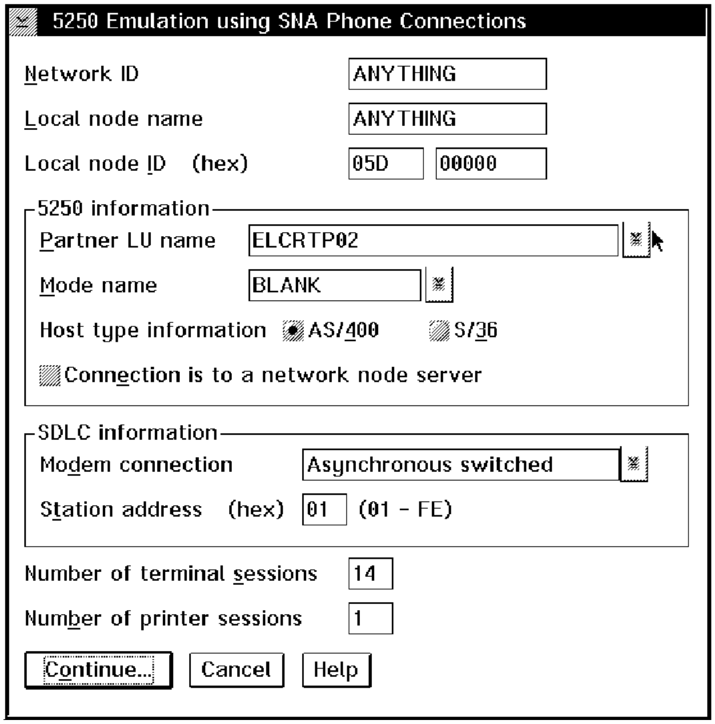
Communications Definitions

- 5250 Emulation using SNA Phone Connections
- 3270 Emulation through SDLC
- 5250 Emulation through SDLC
- 3270 Emulation through Ethernet (ETHERAND) Network
- 5250 Emulation through Ethernet (ETHERAND) Network

5250 emulation using SNA Phone Connections to an AS/400 or a S/36

Figure 65. Communications Manager Configuration Definition

3. From the list of commonly used definitions, select **5250 Emulation using SNA Phone Connections**, and then click on **Configure** to get the window shown below (which is the first of two windows used by the quick configuration process) and enter the required fields as shown:



Network ID: ANYTHING

Local node name: ANYTHING

Local node ID (hex): 05D 00000

5250 information

Partner LU name: ELCRTP02

Mode name: BLANK

Host type information: ● AS/400 ○ S/36

☐ Connection is to a network node server

SDLC information

Modem connection: Asynchronous switched

Station address (hex): 01 (01 - FE)

Number of terminal sessions: 14

Number of printer sessions: 1

Figure 66. 5250 Emulation Using SNA Phone Connections

- **Network ID**

  In this scenario it can be any name you like, although this is usually provided to you by your network administrator since each organization has naming conventions that need to be followed.

- **Local node name**

  The local node name is your Control Point LU, and it can be anything you like in this case. AS/400 will generate its own name to identify the workstation when connecting.

- **Local node ID (hex)**

  Can be any value for this scenario, since it is a secondary link station role.

- **5250 information**

  - Partner LU name

    This is the important parameter for this connection. It is the system AS/400 name, and should be given to you by your network administrator. If you have access to the AS/400 however, you can find this name by displaying the network attributes with the command DSPNETA in the AS/400 configuration.

  - Mode name

    It is any mode from the list box, but it is recommended to use #INTER or BLANK, since 5250 emulation is an interactive session.

  - Host type information

    In this scenario it is connecting to AS/400.

  - Connection is to a network node server

If you are part of an APPN network and the AS/400 is to act as your network node server, then you would need to select this box. Otherwise, do not select it. This is something that would be indicated to you by your network administrator.

This scenario did not connect to a network node.

- **SDLC information**
  - Modem connection

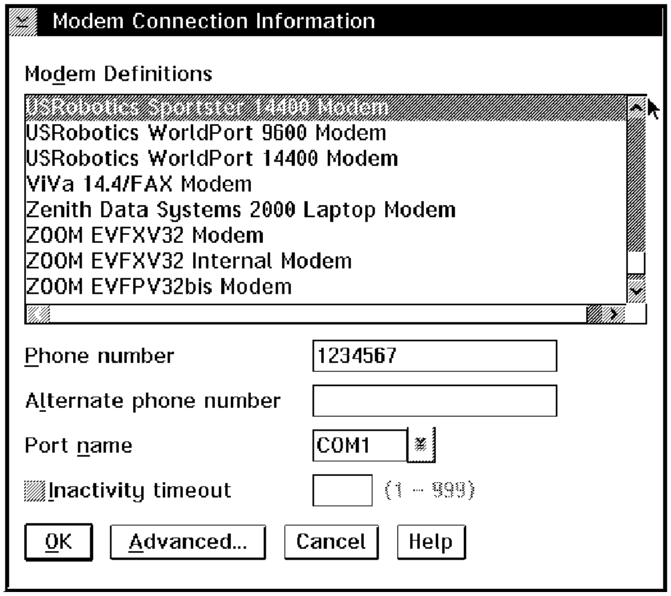
    Select **Asynchronous switched** from the list box.
  - Station address (hex)

    Can be anything, as this is an asynchronous connection.
- **Number of terminal sessions**

  Can be any number from 0 to 15, however the total number of terminal sessions cannot be more than 15.
- **Number of printer sessions**

  Can be any number from 0 to 15, however the total number of terminal and printer sessions cannot be more than 15.

4. Select **Continue** to get the second quick configuration window, as shown below:



Modem Connection Information

Modem Definitions

USRobotics Sportster 14400 Modem
USRobotics WorldPort 9600 Modem
USRobotics WorldPort 14400 Modem
ViVa 14.4/FAX Modem
Zenith Data Systems 2000 Laptop Modem
ZOOM EVFXV32 Modem
ZOOM EVFXV32 Internal Modem
ZOOM EVFPV32bis Modem

Phone number: 1234567
Alternate phone number:
Port name: COM1
Inactivity timeout (1 - 999)

Figure 67. Modem Connection Information

- **Modem Definitions**

  Select the modem that will be used. In this scenario, US Robotics Sportster 14400 modems were used.
- **Phone number**

  Enter the telephone number required to dial to the AS/400. The format to use here is the same as if you were manually dialing this number. It is highly dependent on your environment.
- **Alternate phone number**

This is optional. It is used only when the primary line is busy or not available.

- **Port name**

  It has a default value of COM1. You can define COM1 up to COM8. Use COM1 for your serial 1 and COM2 for your serial 2, etc. To determine the serial port configuration use the reference diskette for your workstation. Refer to your workstation manual as well if required.

- **Inactivity timeout**

  Do not select Inactivity timeout unless it is required.

  When the Inactivity timeout field is selected a number (representing minutes) should be entered between 1 - 999. The inactivity timeout limits the amount of time a link can be unused or idle before it is automatically disconnected. For example, if you set the timeout to 30, then the link will be automatically disconnected when 30 minutes have elapsed without any data traffic on the link.

Select **OK** to end the configuration.

At this point, if this is the first time that this is configured, there may be installation activity taking place as a result of this new configuration. You will need to reboot the workstation because there will have been updates made to CONFIG.SYS as well as PROTOCOL.INI, in addition to additional components being installed in CMLIB.

6.2 Related Files

In this section, we illustrate some changes and additions that have been made, by this configuration, to some of the system files. This may be handy if you need to verify that your configuration was indeed successful and produced the same results as ours.

6.2.1 CONFIG.SYS

This configuration will add the following lines to CONFIG.SYS, if they were not already present. They are the OS/2 device driver for the COM port, the SDLC protocol driver for a switched network and the virtual MAC device driver for SDLC.

```
DEVICE=E:\CMLIB\SDLCSNET.OS2
DEVICE=E:\CMLIB\SDLCVMAC.SYS
DEVICE=E:\CMLIB\CMKFMDE.SYS
DEVICE=E:\IBMCOM\MACS\COMMAC.SYS
```

6.2.2 PROTOCOL.INI

In PROTOCOL.INI, you should see an entry for the US Robotics Sportster (USRSPORT) Port Connection Manager, along with an entry for the COMMAC driver (ADLCMAC_NIF) and the SDLC protocol driver for a switched network (SDLC_SWNET).

```
[USRSPORT]

    DIALOGTYPE = †ATCMD.DDF†
    SYNCHRONICITY = †Asynchronous†
    PORTNAME = COM1
    ACCPTINCCALL = †NO†
    MODEMCLASS = †V.32bis†
    SERIALPORTSPEED = 38400
    AUTOBAUDDETECT = †Off†
    FLOWCONTROL = †RTS/CTS†
    PERMCONNECTION = NO
    CFGTYPE = Locked
    INITIALIZATION1 = †ATB0E1F1M3Q0V1X6&A3&B1&C1&D2\CR†
    INITIALIZATION2 = †AT&H1&I0&K3&M4&N0&R2&S1S0=2\CR†
    INITIALIZATION3 = †AT&H1&I0&K3&M4&N0&R2&S1S0=0\CR†
    DIALPREFIX = †ATDT†
    DIALSUFFIX = †\CR†
    SUCCESS = †OK\CR\LF†
    FAILURE = †ERROR\CR\LF†
    CONNECTPREFIX = †CONNECT†
    CONNECTSUFFIX = †\CR\LF†
    ESCAPE = †+++†
    HANGUP = †ATH\CR†
    RINGBACK = †RING\CR\LF†
    BUSY = †BUSY\CR\LF†
    NOCARRIER = †NO CARRIER\CR\LF†
    NODIALTONE = †NO DIALTONE\CR\LF†
    NOANSWER = †NO ANSWER\CR\LF†
    VOICE = †VOICE\CR\LF†
    RING = †RING\CR\LF†

[SDLC_SWNET]

    DRIVERNAME = SDLCSNET
    BINDINGS = SDLCVMAC0, SDLCVMAC1
    CFGTYPE = Locked

[ADLCMAC_nif]

    DRIVERNAME = ADLCMAC$
    PORTNAME = †COM1†
    PCMCIA = †NO†
    RX_FIFO_SIZE = 8
    TX_FIFO_SIZE = 8
```

Note

In this scenario the serial port speed used was 38400 bps. This speed is supported by the AS/400 ASCII Controller RS-232 interface. However, the switched line conditions must also be able to support this speed.

6.2.3 NETWORK.INI

In NETWORK.INI, the autostart parameter for the USRSPORT entry should have been set to YES.

```
DLL = ACSVSPCM
ENTRY = StartVPCM
PIF = USRSPORT.PIF
PCMNAME = USRSPORT
AUTOSTART = YES
TITLE = USRobotics Sportster 14400 Modem
```

6.2.4 Example of AS/400 Configuration

Here are some of the elements that need to be configured on the AS/400.

Note

The ASCII Workstation Controller on the AS/400 is a combined workstation controller and workstation adapter for attaching selected ASCII displays and printers to the AS/400, just as the Twinaxial Workstation Controller is used for attaching 5250 displays and printers.

Display Line Example

```
Display Line Description

Line description                : LIND      QTDL327800
Option                          : OPTION    *ALL
Category of line                :           *TDLC
Attached workstation ctl        : WSC       CTL02
On line at IPL                  : ONLINE    *YES
Text                            : TEXT      *BLANK
Attached nonswitch controllers  : CTL

Create LINE command example:

CRTLINTDLC LIND(QTDL327800) WSC(CTL02) ONLINE(*YES) TEXT(*BLANK)
```

Display Controller Example

```
Display Controller Description

Controller description


Controller description          : CTLD      CTL02
Option                          : OPTION    *ALL
Category of controller          :           *LWS
Controller type                 : TYPE      6041
Controller model                : MODEL     1
Resource name                   : RSRCNAME  CTL02
On line at IPL                  : ONLINE    *YES
TDLC line                       :           QTDL327800
Auto-configuration controller   : AUTOCFG   *YES
Text                            : TEXT      AUTO-CONFI

Create CONTROLLER command example:

CRTCTLLWS CTLD(CTL02) TYPE(6041) MODEL(1) RSRCNAME(CTL02) ONLINE(*YES) +
      DEVWAITTMR(10) AUTOCFG(*YES) TEXT(¢CREATED BY AUTO-CONFIGURATION¢)
```

Display Device Example

```
Display Device Description

Device description             : DEVD       ASYNC04
Option                         : OPTION     *ALL
Category of device             :            *DSP
Device class                   : DEVCLS     *LCL
Device type                    : TYPE       5150
Device model                   : MODEL      A1
Port number                    : PORT       4
Physical attachment            : ATTACH     *MODEM
Online at IPL                  : ONLINE     *YES
Attached controller            : CTL        CTL02
Keyboard language type         : KBDTYPE    TAB
Print device                   : PRTDEV     *SYSVAL
Output queue                   : OUTQ       *DEV
Printer file                   : PRTFILE    QSYSPRT
Library                        :            *LIBL
Inactivity timer               : INACTTMR   NOMAX
Line speed                     : LINESPEED  *CALC
Word length                    : WORDLEN    *CALC
Type of parity                 : PARITY     *CALC
Stop bits                      : STOPBITS   1
Maximum outstanding frames     : MAXOUT     7
Idle timer                     : IDLTMR     40
NRM poll timer                 : NRMPOLLTMR 3
Frame retry                    : FRAMERTY   15
Workstation customizing object : WSCST      *NONE
Text                           : TEXT       *BLANK


Create DEVICE command example:

CRTDEVDSP DEVD(ASYNC04) DEVCLS(*LCL) TYPE(5150) MODEL(A1) PORT(4) +
          ATTACH(*MODEM) ONLINE(*YES) CTL(CTL02) KBDTYPE(TAB)     +
          PRTDEV(*SYSVAL) OUTQ(*DEV) PRTFILE(*LIBL/QSYSPRT)       +
          INACTTMR(*NOMAX) LINESPEED(*CALC) WORDLEN(*CALC)        +
          PARITY(*CALC) STOPBITS(1) MAXOUT(7) IDLTIMER(40)        +
          NRMPOLLTMR(3) FRAMERTY(15)
```

6.2.5 Cabling Considerations

The cable (A) used to attach the AS/400 ASCII controller to the modem is a special crossover cable. The P/N of this cable is 69X7016.

The cable (B) used to attach the PS/2 to the modem is a normal RS-232 cable.

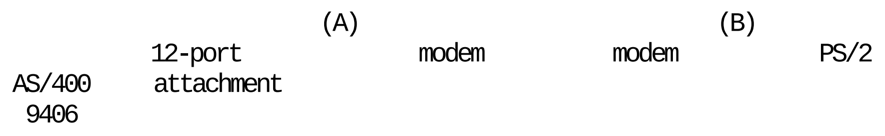


Figure 68. AS/400 and PS/2 Connection

The pin layouts of the special cable that is necessary to connect the AS/400 ASCII controller to the modem are described below:

ASCII CTL end, DB25 plug connector for ports 0-17 (DCE)		Modem end, DB25 plug connector (DCE)
	Cable Shield	
2	Receive Data	3
3	Transmit Data	2
4	Clear to Send	5
5	Request to Send	4
6	Data Terminal Ready	20
7	Signal Ground	7
8	Data Carrier Detect	8
20	Data Set Ready	6
23	Rate Select (+12V)	23

Figure 69. ASCII Controller to Modem Cable

Please see *AS/400 Physical Planning Guide and Reference, GA41-9571* for more details.

Also see Chapter 3 in *V2R3 PC Support/400 and Microsoft Windows 3.1 Advanced Topics, GG24-4253* for additional information on asynchronous connections to an AS/400.

Note

In other words the special cable, P/N 69X7016, used to attach an AS/400 ASCII workstation controller to a modem is a cable normally used to connect one DCE to another DCE.

Chapter 7. Configuration Example - APPC from PS/2 to PS/2 over an Asynchronous Connection

This chapter describes the configuration setup for APPC applications to communicate using a COM port and an SNA Phone Connect asynchronous connection between two PS/2s.

The setup is shown below in Figure 70.

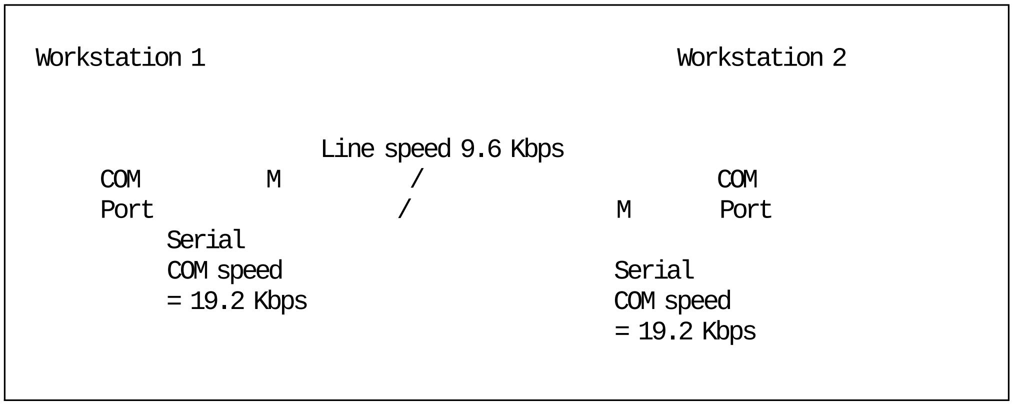


Figure 70. APPC Application Using Asynchronous Communications

The equipment used is as follows:

- PS/2 Model 95 - workstation 1
- PS/2 Model 80 - workstation 2
- A pair of IBM 7855 modems

Each workstation will be configured to accept incoming call so that the call can be initiated from either workstation.

Note

This chapter only explains the CM/2 configuration process for a specific scenario. Refer to Chapter 1, "SNA Phone Connect Overview" on page 1 and Chapter 2, "CM/2 SNA Phone Connect Configuration" on page 11 for more general configuration information. Make sure that you have installed LAPS level WR07020 or above before configuring SNA Phone Connect.

7.1 CM/2 Configuration Process

7.1.1 Configuration for Workstation #1

1. Start the Communications Manager Setup and select **Setup**. Select the configuration file name that will be used, or create a new one, for example, PS2DTOA, as used in this scenario.

© Copyright IBM Corp. 1995

Note

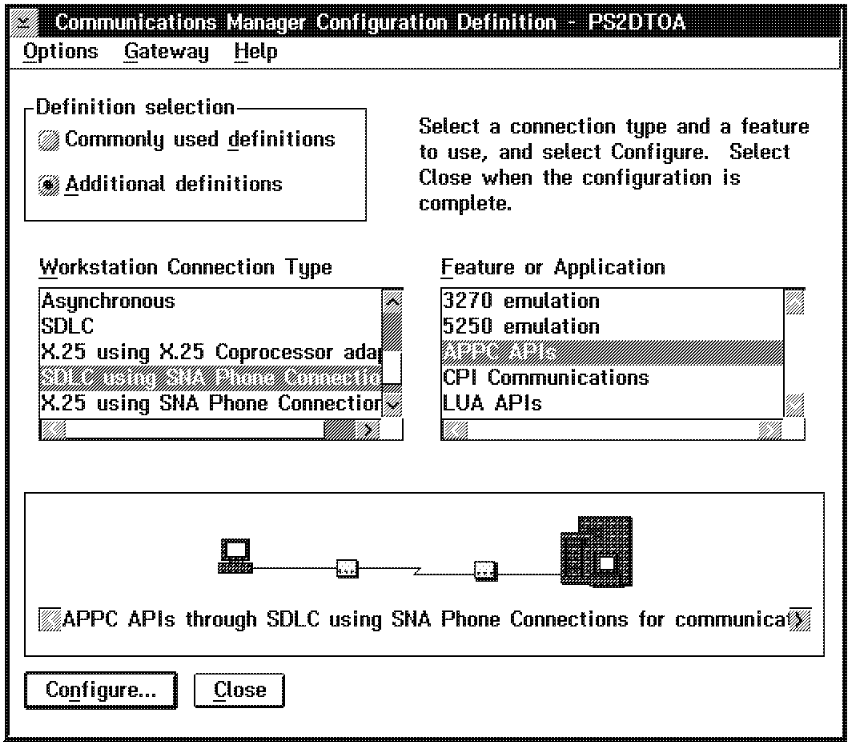
If you are updating an existing configuration file the sequence of windows that you see may differ from what is shown here. This scenario assumes you are creating a new configuration file.

2. Then continue to the Communications Manager Configuration Definition window.

   If the radio button in the Definitions Selection box is set to "Commonly Used Definitions," you will need to set it to "Additional Definitions."

   This is because there isn′t a quick configuration process for APPC using SNA Phone Connect, and we need to use the advanced configuration process.

   When you select the additional definitions, you will get the panel below:


Communications Manager Configuration Definition - PS2DTOA
Options Gateway Help
Definition selection
Workstation Connection Type
Asynchronous
SDLC
X.25 using X.25 Coprocessor ada
SDLC using SNA Phone Connectio
X.25 using SNA Phone Connection
Feature or Application
3270 emulation
5250 emulation
APPC APIs
CPI Communications
LUA APIs
Configure...
Close

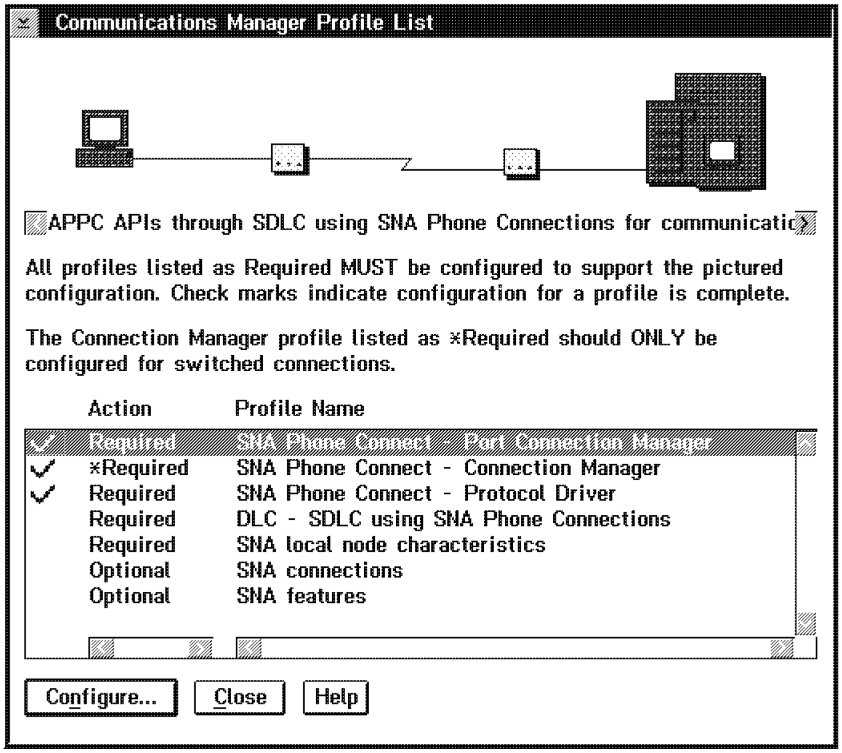
○ Commonly used definitions
● Additional definitions

Select a connection type and a feature to use, and select Configure. Select Close when the configuration is complete.

APPC APIs through SDLC using SNA Phone Connections for communica

Figure 71. Advanced Configuration for APPC Application

3. Select **SDLC using SNA Phone Connection** as the workstation connection type and **APPC APIs** as the application, then click on **Configure...** to get into the Profile List as shown below:



Communications Manager Profile List

APPC APIs through SDLC using SNA Phone Connections for communicatic

All profiles listed as Required MUST be configured to support the pictured configuration. Check marks indicate configuration for a profile is complete.

The Connection Manager profile listed as ×Required should ONLY be configured for switched connections.

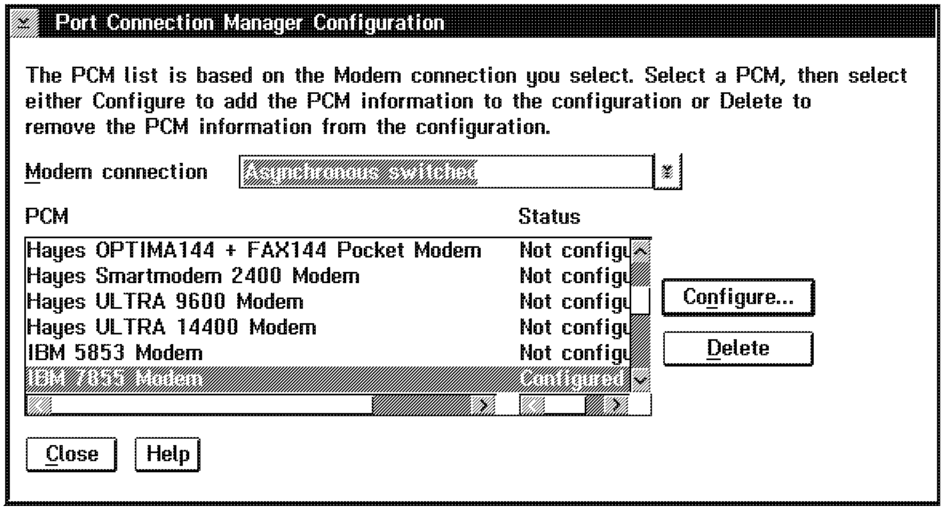
	Action	Profile Name
✓	Required	SNA Phone Connect - Port Connection Manager
✓	×Required	SNA Phone Connect - Connection Manager
✓	Required	SNA Phone Connect - Protocol Driver
	Required	DLC - SDLC using SNA Phone Connections
	Required	SNA local node characteristics
	Optional	SNA connections
	Optional	SNA features

Figure 72. CM/2 Profile List

If this is your first time configuring SNA Phone Connect, then all the profiles should be without a check mark on the left hand side.

In this scenario, even though we are creating a new CM/2 configuration file, the SNA PHONE Connect profiles do show a check mark besides them because PCMs were configured previously for other configuration files and they currently exist in the PROTOCOL.INI and NETWORK.INI files. Therefore, even though this is a brand new CM/2 configuration file, it is normal that the SNA PHONE CONNECT profiles show as configured.

4. PCM Configuration - Select **Port Connection Manager** and click on **Configure** which will display the panel below:



Port Connection Manager Configuration

The PCM list is based on the Modem connection you select. Select a PCM, then select either Configure to add the PCM information to the configuration or Delete to remove the PCM information from the configuration.

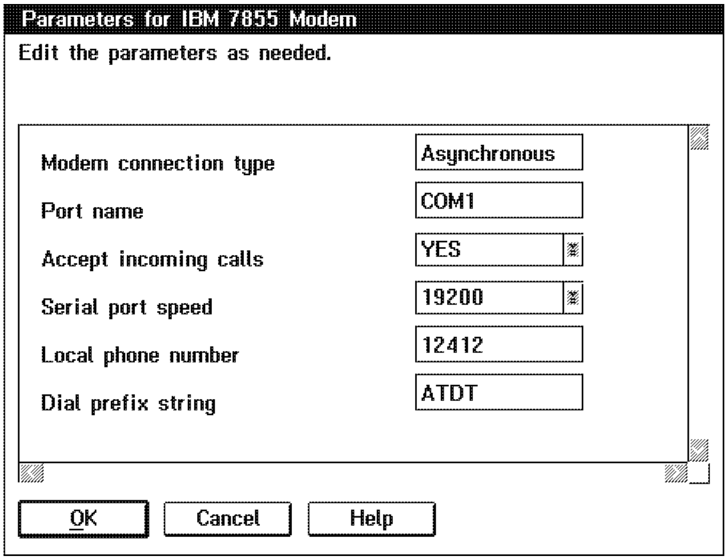
Modem connection: Asynchronous switched

PCM	Status
Hayes OPTIMA144 + FAX144 Pocket Modem	Not configu
Hayes Smartmodem 2400 Modem	Not configu
Hayes ULTRA 9600 Modem	Not configu
Hayes ULTRA 14400 Modem	Not configu
IBM 5853 Modem	Not configu
IBM 7855 Modem	Configured

Figure 73. PCM Configuration

5. Select **Asynchronous switched** in the modem connection list box and then select your modem type as it is listed in the PCM list box. In this example, we selected IBM 7855 Modem and clicked on **Configure** to display the PCM configuration window, as shown below:

> **Note**
>
> Notice that the IBM 7855 Modem was showing as already configured (in Figure 73 on page 91) because we had used it before. If we were going to use another type of modem this time, then we only need to select and configure a different modem type, in addition to the IBM 7855.



Parameters for IBM 7855 Modem

Edit the parameters as needed.

Modem connection type: Asynchronous
Port name: COM1
Accept incoming calls: YES
Serial port speed: 19200
Local phone number: 12412
Dial prefix string: ATDT

Figure 74. Parameters for IBM 7855 Modem

The parameters are as follows:

- **Modem connection type**

  This value cannot be changed here. It came from what you selected in Figure 73 on page 91.

- **Port name**

  This scenario uses COM 1 as the serial port connection.

- **Accept incoming calls**

  The default value is “NO.” In this case we need to change this to “YES” since we want to accept incoming calls.

- **Serial port speed**

  This scenario uses 19200 bps.

- **Local phone number**

  The local phone number is optional and would be used only when you want to associate this PCM to a specific incoming call directory entry, where you would specify the same number in the called party entry of the incoming call directory entry.

- **Dial prefix string**

  Use the default value, that is “ATDT.”

6. Select **OK** to return to the PCM Configuration window and continue by selecting **Close** to return to the CM/2 Profile List.
7. Connection Manager Configuration - Select the **Connection Manager** profile and click on **Configure** to get the main Connection Manager configuration window, as shown below:

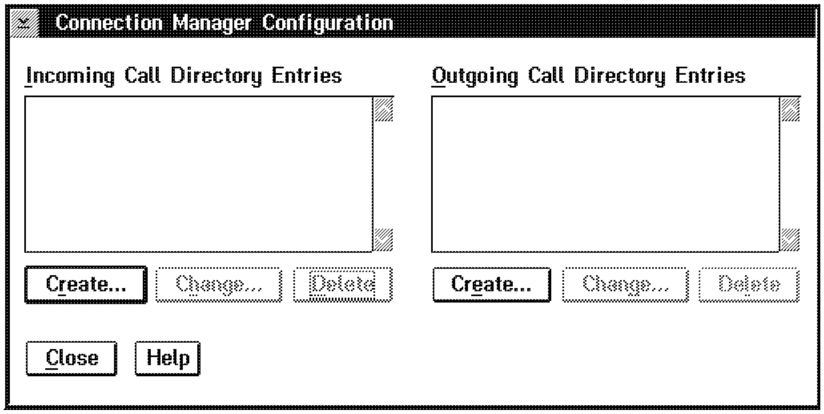
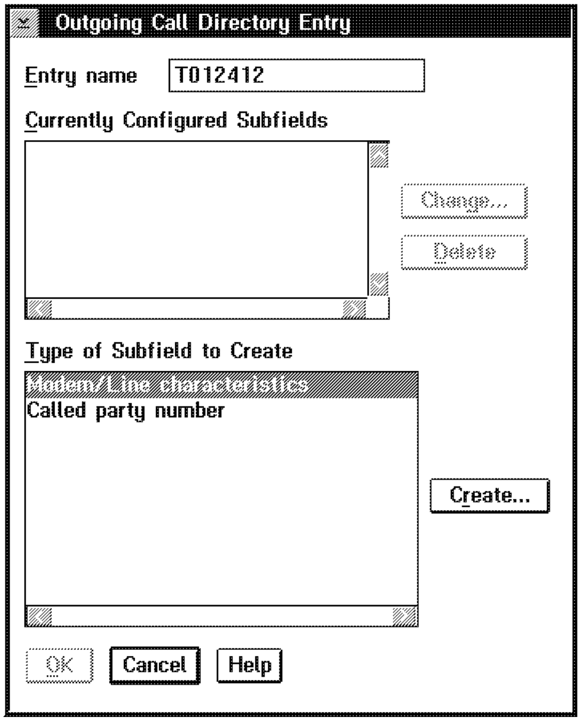

Connection Manager Configuration
Incoming Call Directory Entries
Outgoing Call Directory Entries
Create...
Change...
Delete
Create...
Change...
Delete
Close
Help

Figure 75. Connection Manager Configuration

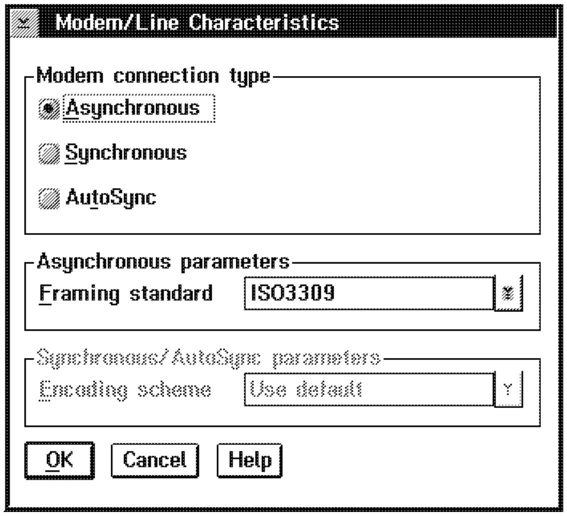
8. First create an outgoing call directory entry by selecting **Create** under Outgoing Call Directory Entries, which displays the following window:


Outgoing Call Directory Entry
Currently Configured Subfields
Change...
Delete
Type of Subfield to Create
Modem/Line characteristics
Called party number
Create...
OK
Cancel
Help

Entry name T012412

Figure 76. Outgoing Call Directory Entry

9. Enter the name for the Outgoing Directory Entry, say `T012412`, for example.
10. Then select **Modem/Line Characteristic** in the "Type of subfield to create," and press Create.



Modem connection type:
- ● Asynchronous
- ○ Synchronous
- ○ AutoSync

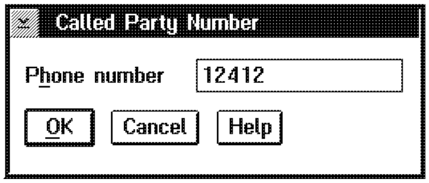
Framing standard: ISO3309

Encoding scheme: Use default

Figure 77. Modem/Line Characteristics

Use all default values as shown above Figure 77. Refer to 2.4.2, “SNA Phone Connect - Connection Manager” on page 26 for details of these parameters.

11. Then select **Called party number**, in the “Type of subfield to create,” and press Create.

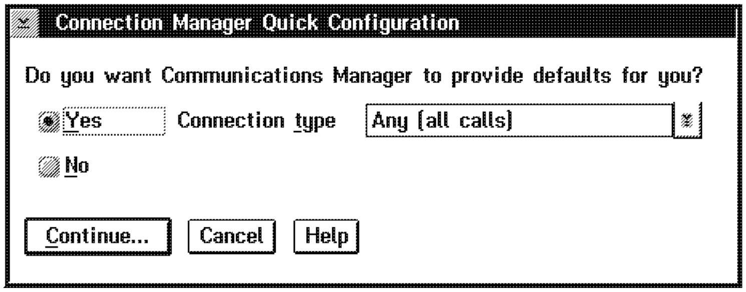


Phone number: 12412

Figure 78. Called Party Number

Enter the telephone number for the workstation to be called as shown here:

12. Then return to the Connection Manager main configuration panel and create the incoming call directory entry by selecting **Create** under Incoming Call Directory Entries to get the following window is displayed:

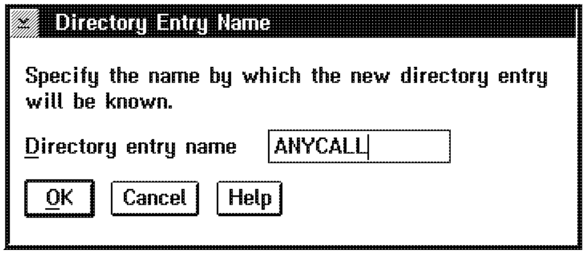


Do you want Communications Manager to provide defaults for you?
- ● Yes
- ○ No

Connection type: Any (all calls)

Figure 79. Create Incoming Call Entry

13. Accept the default value and click on **Continue...** to get the following panel:

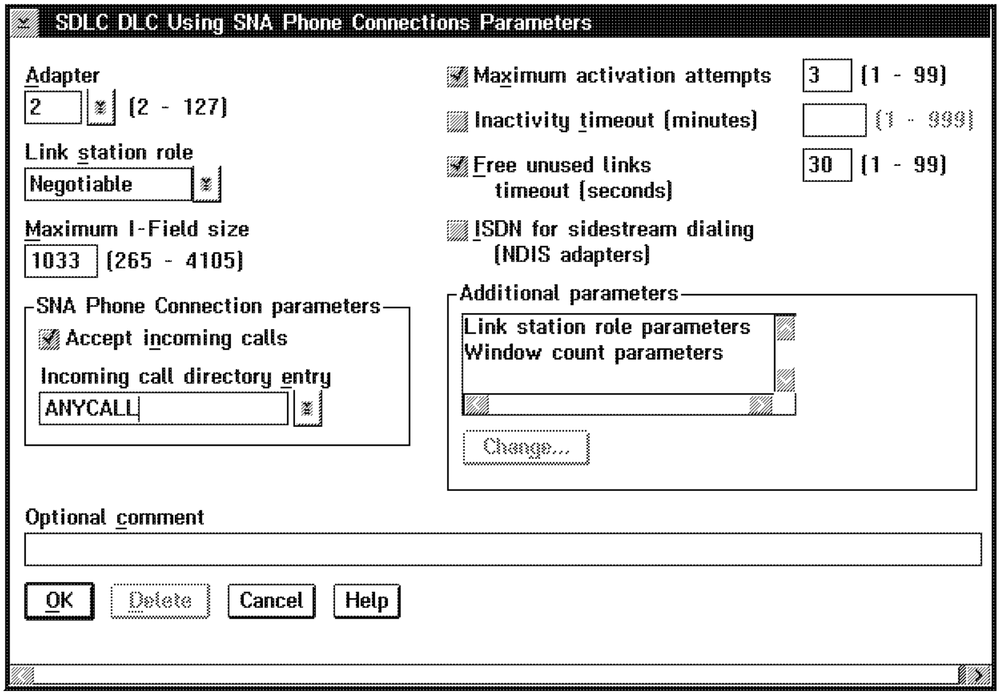

Directory Entry Name

Specify the name by which the new directory entry will be known.

Directory entry name: ANYCALL

Figure 80. Incoming Call Entry Name

14. Enter a name to designate this particular entry, for example `Anycall` and **OK** to return, and then return to the Profile List by selecting **Close** in the Connection Manager Configuration.
15. If this is your first time configuring SNA Phone Connect, select the **Protocol Driver** profile, and configure it by answering YES to update the PROTOCOL.INI file with the appropriate SDLC protocol driver for switched network operation.
16. Select **DLC-SDLC using SNA Phone Connections** profile and click on **Configure** to get the panel below:


SDLC DLC Using SNA Phone Connections Parameters

Adapter: 2 (2 - 127)

Link station role: Negotiable

Maximum I-Field size: 1033 (265 - 4105)

SNA Phone Connection parameters

☑ Accept incoming calls

Incoming call directory entry: ANYCALL

☑ Maximum activation attempts: 3 (1 - 99)

☐ Inactivity timeout (minutes): (1 - 999)

☑ Free unused links timeout (seconds): 30 (1 - 99)

☐ ISDN for sidestream dialing (NDIS adapters)

Additional parameters

Link station role parameters
Window count parameters

Optional comment:

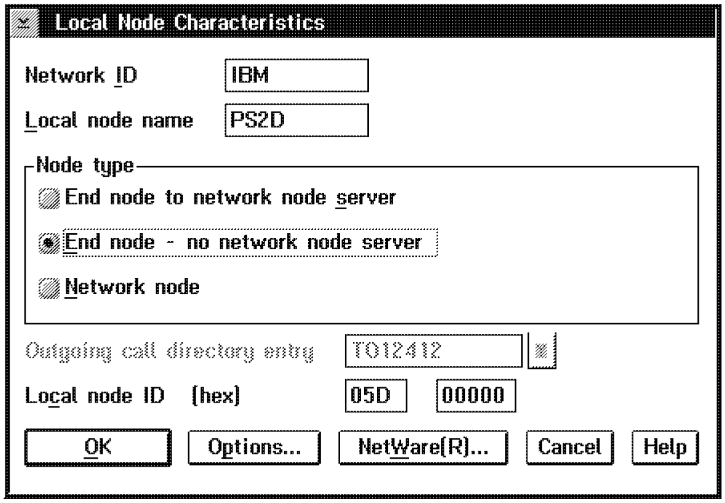
Figure 81. SDLC DLC SNA Phone Connections Configuration

The logical adapter number is automatically selected as **2** because 0 and 1 are reserved for the normal DLC - SDLC without SNA Phone Connect and real MPA adapters. When using SNA Phone Connect, the adapters used might not be a real MPA, so this value now represents a virtual port and can have the value 2 to 127.

Note

A virtual port is defined every time a new DLC profile is created. It is not associated with any physical adapter, which is why it is called a "virtual" port. A virtual Port DLC can use multiple "Logical adapters" unlike a DLC which is configured for a specific physical port. One logical adapter is used up for every logical link. A virtual port is associated with an incoming call directory entry if it is to accept incoming calls. Logical links (SNA connections) are associated with outgoing call directory entries (or permanent connections) and point to a virtual port. In most configurations, you need only one virtual port per type of DLC such as SDLC, IDLC, etc.

17. Select the **Accept incoming calls** check box, then use the list box to select the entry **ANYCALL** (which we have just configured in the Connection Manager profile), then select **OK** to return to the CM/2 Profile List.
18. Select the **SNA local node characteristics** profile from the profile list and click on **Configure** to display the window shown below:



Local Node Characteristics

Network ID: IBM

Local node name: PS2D

Node type

○ End node to network node server

● End node - no network node server

○ Network node

Outgoing call directory entry: TO12412

Local node ID (hex): 05D 00000

Figure 82. SNA Local Node Characteristics

The parameters are:

- **Network ID**

  In this scenario it can be any name you like, although this is usually provided to you by your network administrator since each organization has naming conventions that need to be followed.

- **Local node name**

  The local node name is the name of your control point LU, and it can be anything you want in this example. We have used PS2D here.

- **Node type**

  Select **End node - no network node server**.

- **Outgoing call directory entry**

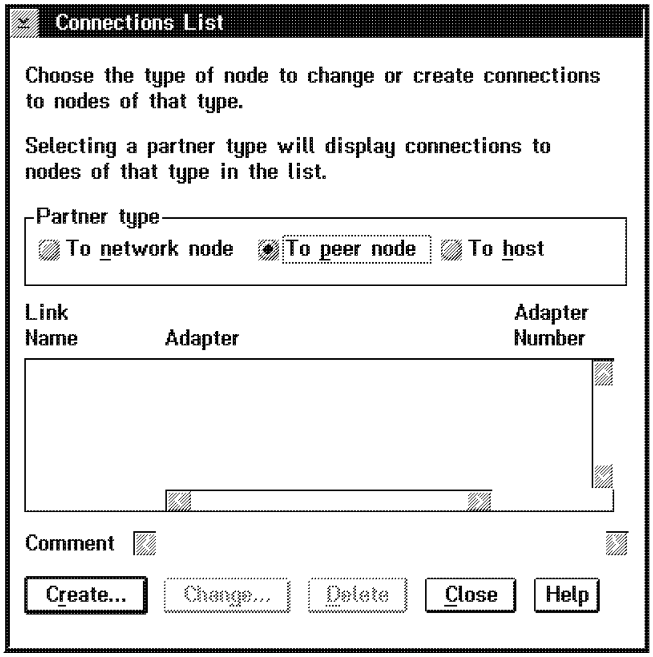
  This is NOT required in this example. This field should be greyed out, and would open up only if you selected the node type as "End no to network node server,” in which case the Outgoing Call directory entry would be required to identify the server as the destination.

- **Local node ID (hex)**

  This has a default value of 00000 and is not required here.

Once completed, select **OK** to return to the profile list.

19. Select the **SNA Connections** profile and click on **Configure** to get the panel below displayed:



Connections List

Choose the type of node to change or create connections to nodes of that type.

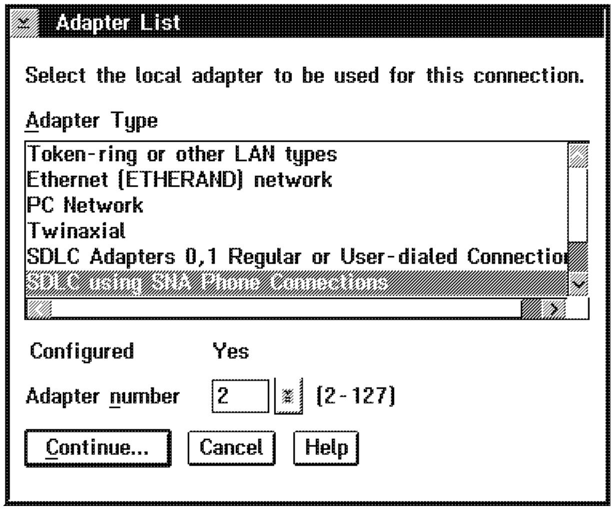
Selecting a partner type will display connections to nodes of that type in the list.

Partner type

○ To network node ● To peer node ○ To host

Figure 83. Connection List

20. Select partner type **To peer node** and **Create...**. The Adapter List window is shown next:



Adapter List

Select the local adapter to be used for this connection.

Adapter Type

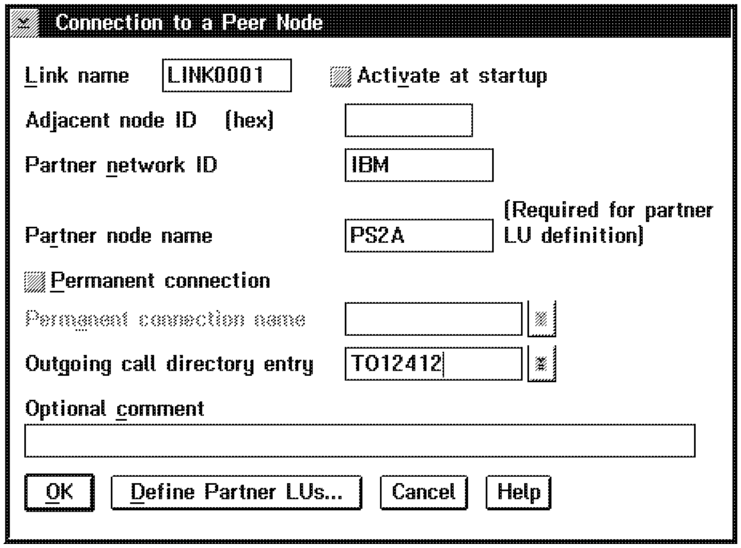
Token-ring or other LAN types
Ethernet (ETHERAND) network
PC Network
Twinaxial
SDLC Adapters 0,1 Regular or User-dialed Connectio
SDLC using SNA Phone Connections

Configured Yes

Adapter number 2 (2-127)

Figure 84. Adapter List

Here you select **SDLC using SNA Phone Connections** and then **Continue...** to get the window shown below:


Connection to a Peer Node

Link name: LINK0001
☑ Activate at startup
Adjacent node ID (hex):
Partner network ID: IBM
Partner node name: PS2A (Required for partner LU definition)
☑ Permanent connection
Permanent connection name:
Outgoing call directory entry: TO12412
Optional comment:

Figure 85. Connection to a Peer Node

The important fields are:

- **Link Name** can be left as the default provided.
- **Partner network ID**

  This partner network ID should be the network ID of the workstation that you want to connect to, that is workstation 2 in this scenario, which we have not configure yet. When we do, we will likely use the same NETID as we used here (that is IBM), but it does not necessarily need to be the same NETID.
- **Partner node name**

  This partner node should be the local node name of the workstation that we want to connect to, in this case, workstation 2, which we have decided to call PS2A.
- **Outgoing call directory entry**

  Enter the outgoing call directory name that contains the phone number of the workstation to which you want to connect. This is the entry name that we created previously in the Connection Manager profile and which we called TO12412.

21. Select **OK** to return to the CM/2 Profile List window. We have completed the configuration for workstation 1 and we now need to configure workstation number 2.

Note

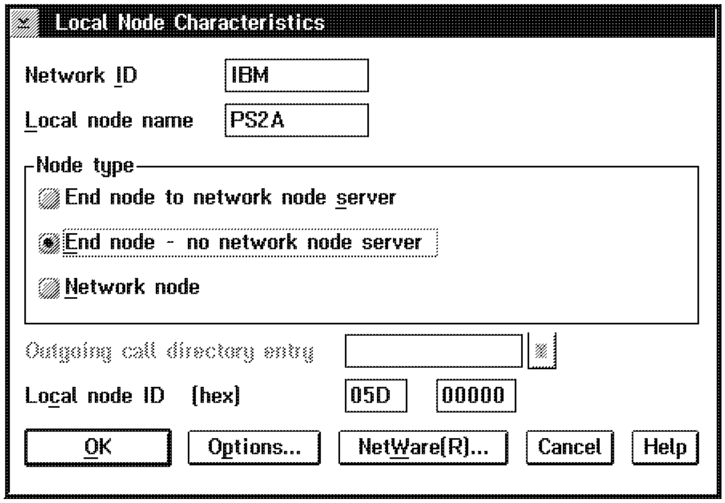
We have not used the Partner LU configuration button on the Connections window because we will be using the local node names of both workstations as the destination LUs that we want to reach, and entries for these will be automatically done when we activate a link between the two workstations. In other APPC scenarios, be aware that you may need to use partner LU definitions in order for this to work.

7.1.2 Configuration for Workstation Number 2

Workstation number 2 can be configured exactly as we did for workstation number 1, in the case where we want to initiate a call between these workstations from either workstation.

In that case, the only configuration differences will be:

1. The Local Node characteristics panel where we will use PS2A as the local node name of workstation 2, as shown below:



Network ID: IBM
Local node name: PS2A
Node type:
○ End node to network node server
● End node - no network node server
○ Network node
Local node ID (hex): 05D 00000

Figure 86. Workstation 2 - Local Node Name

2. The outgoing call directory entry where the telephone number in the Called Party Number will be the phone number of workstation number 2.

If you want to simplify even further and decide that you will only initiate calls from workstation 1, then, when you configure workstation 2, you still make the local node name PS2A, as indicated above, but you then do not need to configure an outgoing call directory entry and you do not need to configure a connection to workstation number 1.

7.2 Testing the Newly Created Configurations

You are now ready to use an APPC application between these two workstations. For that purposes, there are many sample APPC applications, supplied with CM/2, which can be used, such as APPCTELL or ATELL, or APING.

Another one for which you do not need any setup whatsoever is to use the remote display capability of the Display Active configuration function in CM/2 Subsystem Management.

Any of these will allow you to communicate using an LU 6.2 session between these two workstations.

7.3 Related Files

In this section, we illustrate some changes and additions that have been made, by this configuration, to some of the system files. This may be handy if you need to verify that your configuration was indeed successful and produced the same results as ours.

7.3.1 CONFIG.SYS

This configuration will add the following lines to CONFIG.SYS, if they were not already present. They are the OS/2 device driver for the COM port, the SDLC protocol driver for switched networks and the SDLC virtual MAC device driver.

```
DEVICE=E:\CMLIB\SDLCSNET.OS2
DEVICE=E:\CMLIB\SDLCVMAC.SYS
DEVICE=E:\CMLIB\CMKFMDE.SYS
DEVICE=E:\IBMCOM\MACS\COMMAC.SYS
```

7.3.2 PROTOCOL.INI

In PROTOCOL.INI, you should see an entry for the IBM7855 Port Connection Manager, along with an entry for the COM MAC driver (ADLCMAC_NIF) and the SDLC protocol driver for a switched network (SDLC_SWNET).

```
 [IBM7855]

    DIALOGTYPE = †ATCMD.DDF†
    SYNCHRONICITY = †Asynchronous†
    PORTNAME = COM1
    ACCPTINCCALL = †YES†
    MODEMCLASS = †V.32†
    SERIALPORTSPEED = 19200
    AUTOBAUDDETECT = †Off†
    FLOWCONTROL = †RTS/CTS†
    PERMCONNECTION = NO
    PHONENUMBER = †12412†
    CFGTYPE = †Locked†
    INITIALIZATION1 = †ATI3\CR†
    INITIALIZATION2 = †ATE1Q0V1X4S7=60S0=2\\R2\\Q2\\X0\\N3\\V1&D2&S1&R0&C1&I0\CR†
    INITIALIZATION3 = †ATE1Q0V1X4S7=60S0=0\\R2\\Q2\\X0\\N3\\V1&D2&S1&R0&C1&I0\CR†
    DIALPREFIX = †ATDT†
    DIALSUFFIX = †\CR†
    SUCCESS = †OK\CR\LF†
    FAILURE = †ERROR\CR\LF†
    CONNECTPREFIX = †CONNECT†
    CONNECTSUFFIX = †\CR\LF†
    ESCAPE = †+++†
    HANGUP = †ATH\CR†
    RINGBACK = †RING\CR\LF†
    BUSY = †BUSY\CR\LF†
    NOCARRIER = †NO CARRIER\CR\LF†
    NODIALTONE = †NO DIALTONE\CR\LF†
    NOANSWER = †NO ANSWER\CR\LF†
    VOICE = †VOICE\CR\LF†
    RING = †RING\CR\LF†

[SDLC_SWNET]

    DRIVERNAME = SDLCSNET
    BINDINGS = SDLCVMAC0, SDLCVMAC1
```

```
     CFGTYPE = Locked

[ADLCMAC_nif]

     DRIVERNAME = ADLCMAC$
     PORTNAME = †COM1†
     PCMCIA = †NO†
     RX_FIFO_SIZE = 8
     TX_FIFO_SIZE = 8
```

7.3.3 NETWORK.INI

In NETWORK.INI, the autostart parameter for the IBM7855 PCM entry should have been set to YES.

```
DLL = ACSVSPCM
ENTRY = StartVPCM
PIF = IBM7855.PIF
PCMNAME = IBM7855
AUTOSTART = YES
TITLE = IBM 7855 Modem
```

Chapter 8. Configuration Example - SNA over Asynchronous to a CM/2 Gateway/Network Node

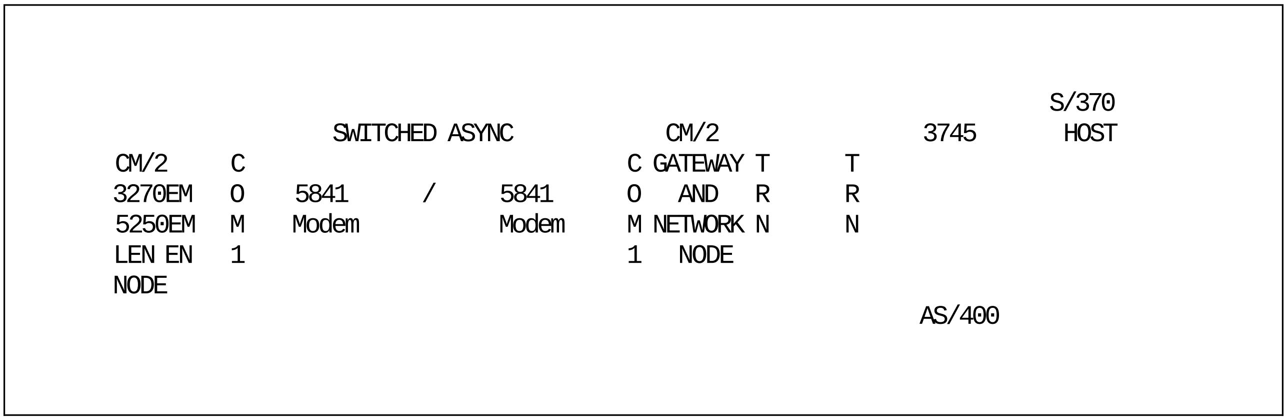


Figure 87. SNA over Asynchronous to a CM/2 Gateway

8.1 Scenario Description

In this scenario, we have a CM/2 end node connected to a CM/2 gateway and network node, using an asynchronous link, the COM1 port, and a pair of IBM 5841 modems. On this link, we are using a 5250 display emulation session to an AS/400 and a 3270 display session to an S/370 host. Both the AS/400 and the S/370 host are on the same LAN as the CM/2 gateway/network node.

8.1.1 Physical Description

On the end node, since we want to use an asynchronous connection, we use the COM1 port and an IBM 5841 modem, operating at 1200 bps, and connected to the public switched network.

On the downstream side of the network node, we are also using the COM1 port and an IBM 5841 modem, set for auto-answer in order to listen in for calls from the end node. On the upstream side, we use a TRN adapter which allows us to connect, over TRN, to both a S/370 host for 3270 emulation, and an AS/400 for 5250 emulation.

8.1.2 Logical Description

The CM/2 network node plays a double role here. First, as a network node, it provides intermediate session routing for independent LUs; in this case, the 5250 emulation session, which uses an independent LU 6.2 session, is routed from the CM/2 end node, through the network node, to the destination LU on the AS/400.

Second, as a dependent LU gateway, it provides access to a S/370 host for LUs that are downstream of the CM/2 gateway node. Therefore, in this case, the S/370 has no knowledge of the downstream CM/2 as a node; the only PU/LU definitions in the S/370 are for the CM/2 network node.

The diagram below tries to illustrate this in a simplified fashion.

© Copyright IBM Corp. 1995

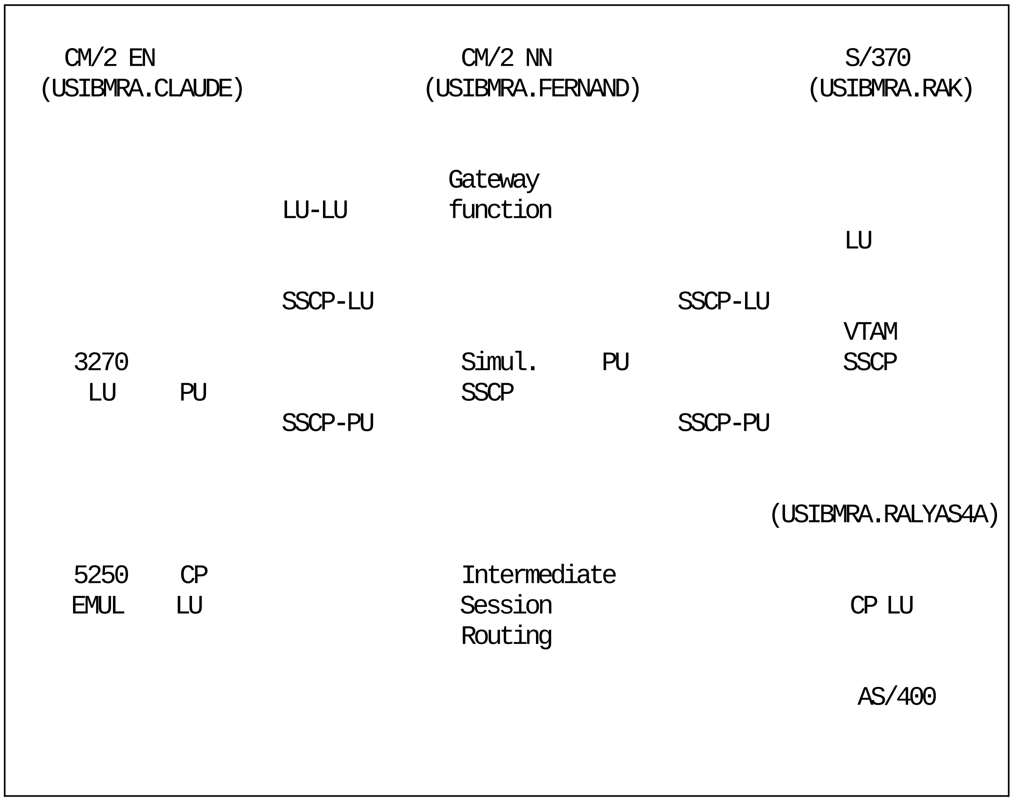


Figure 88. SNA over Asynchronous Example - Logical View

8.2 Quick Configuration of the End Node

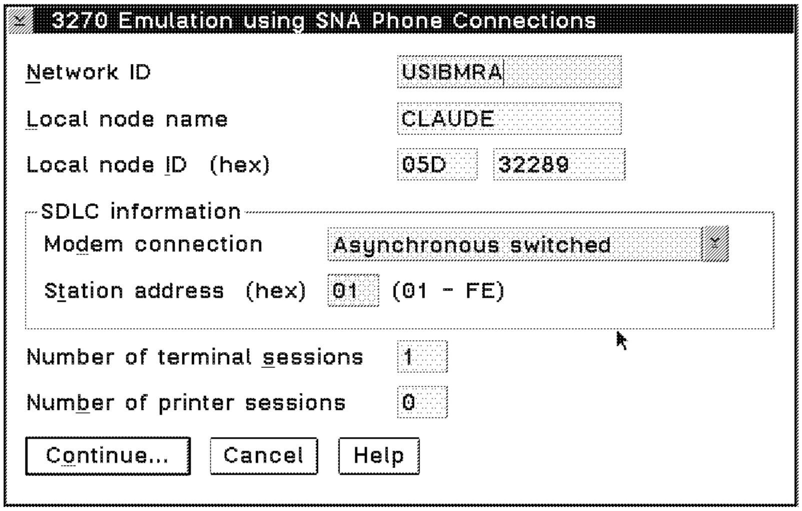
The easiest way to configure the end node is to use the quick configuration panel method. However, for this example, we need to configure both the 3270 and the 5250 Emulation features, for which there is no single quick configuration process.

Therefore, we will first use the quick configuration process for 3270 Emulation, and once completed, before exiting the configuration, will then use the 5250 Emulation quick configuration process to complete what we need for this example.

After starting the configuration process through CMSETUP, and giving a name to our new configuration file (we called it SNAATEST), we get to the main configuration panel, that is the one showing a list of the commonly used definitions.

We then select the 3270 emulation using SNA Phone Connections from the Common Definitions list.

On the first panel (see Figure 89 on page 105 below), you should already be familiar with all of the parameters, except for the Modem Connection parameter, which is the new parameter related to SNA Phone Connect. It has a drop down list from which you select asynchronous switched, and we let the station address default to 01.



3270 Emulation using SNA Phone Connections

Network ID: USIBMRA

Local node name: CLAUDE

Local node ID (hex): 05D 32289

SDLC information

Modem connection: Asynchronous switched

Station address (hex): 01 (01 - FE)

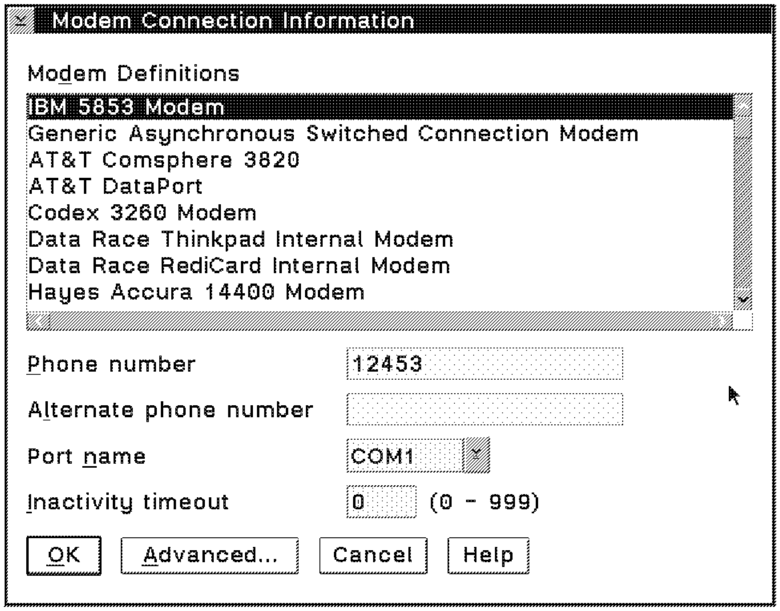
Number of terminal sessions: 1

Number of printer sessions: 0

Figure 89. 3270 Emulation Using SNA Phone Connect Quick Configuration - Panel 1

In the second panel of the quick configuration (see Figure 90 below), we select a specific modem to be used with the asynchronous connection. In this case, the IBM 5841 that we are using was not present in the list; however, the IBM 5853 is a pretty similar modem (with probably only the speed being different), so we chose this one. We will change the speed selection later on by manually altering the PROTOCOL.INI entry for this PCM.

We also have to specify the phone number to be auto-dialed at connection time and the COM port to be used (COM1 was pre-selected by default).



Modem Connection Information

Modem Definitions

- IBM 5853 Modem
- Generic Asynchronous Switched Connection Modem
- AT&T Comsphere 3820
- AT&T DataPort
- Codex 3260 Modem
- Data Race Thinkpad Internal Modem
- Data Race RediCard Internal Modem
- Hayes Accura 14400 Modem

Phone number: 12453

Alternate phone number:

Port name: COM1

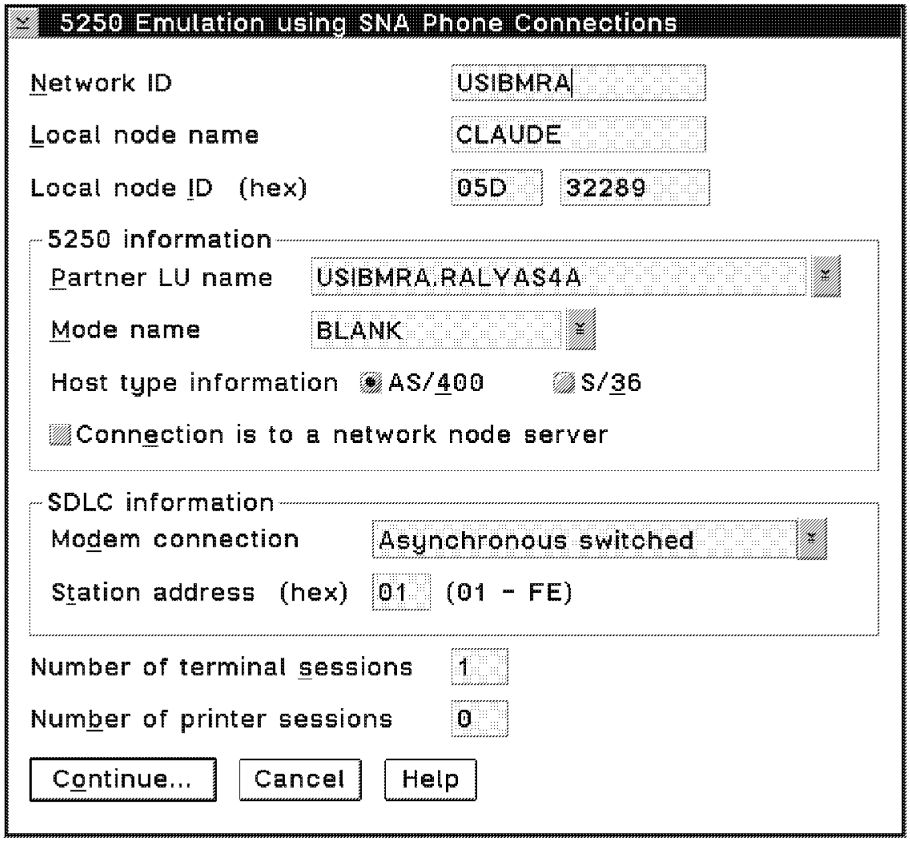
Inactivity timeout: 0 (0 - 999)

Figure 90. 3270 Emulation using SNA Phone Connect Quick Configuration - Panel 2

Clicking on OK brings us back to the main configuration panel. If all we wanted was 3270 Emulation over asynchronous, our configuration would now be complete and we could exit the configuration process at this time.

However, in this case, we also want to configure 5250 emulation, so we then select the 5250 Emulation using SNA Phone Connect entry from the Common

Definitions list, right below the 3270 entry we have used before, and click on Configure, which brings us the following panel:



5250 Emulation using SNA Phone Connections

Network ID: USIBMRA

Local node name: CLAUDE

Local node ID (hex): 05D 32289

5250 information

Partner LU name: USIBMRA.RALYAS4A

Mode name: BLANK

Host type information: ● AS/400 ○ S/36

☐ Connection is to a network node server

SDLC information

Modem connection: Asynchronous switched

Station address (hex): 01 (01 - FE)

Number of terminal sessions: 1

Number of printer sessions: 0

Figure 91. 5250 Emulation Using SNA Phone Connect Quick Configuration - Panel 1

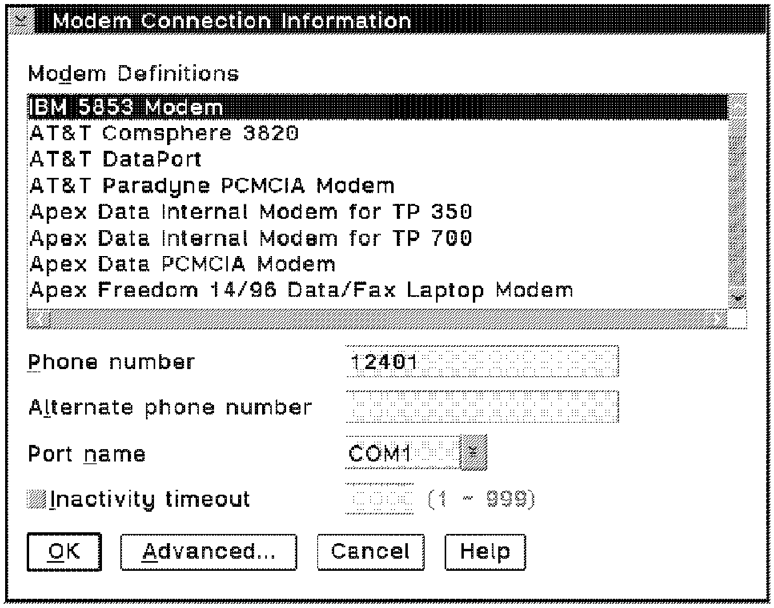
On this first window of the 5250 Emulation quick configuration, all the values we used in the 3270 Emulation configuration , and which are applicable, have been pre-selected by default. Now we need to supply the name of partner LU on the AS/400, which should be supplied to you by your network administrator (in our case this was USIBMRA.RALYAS4A).

We also need to indicate a mode to be used; use the list box and select either BLANK or #INTER which are for interactive type sessions, or any user mode that you might have and want to use.

Finally, we need to indicate the number of 5250 sessions that we need. In this case, we selected only one.

There is no need to change any of the modem connection information since we are using the same connection that we configured for 3270 emulation.

Click on continue to get the second panel (shown below in Figure 92 on page 107), where there is nothing new to specify; that′s because it is identical to the panel for 3270 emulation.



IBM 5853 Modem
AT&T Comsphere 3820
AT&T DataPort
AT&T Paradyne PCMCIA Modem
Apex Data Internal Modem for TP 350
Apex Data Internal Modem for TP 700
Apex Data PCMCIA Modem
Apex Freedom 14/96 Data/Fax Laptop Modem

Phone number 12401
Alternate phone number
Port name COM1
Inactivity timeout (1 - 999)

Figure 92. 5250 Emulation Using SNA Phone Connect Quick Configuration - Panel 2

So, clicking on OK at this point brings us back to the main configuration panel, where we click on Close to exit the configuration process.

At this point, the file verification will take place and installation activities may take place if this is the first time that this was configured. Most likely, there will be a need to reboot if installation of any component was done and if some of the system files needed to be updated.

8.3 PROTOCOL.INI and NETWORK.INI Entries

Let′s now take a look at the changes that were made to system files as a result of configuring the above profiles. In summary, as illustrated in the following figure, the following changes have been made:

- A statement for the MAC driver (COMMAC.SYS) and two for the SDLC protocol (SDLCSNET and SDLCVMAC) were added to CONFIG.SYS.
- A PCM entry (IBM5853) was changed in NETWORK.INI to AUTOSTART=YES by the PCM configuration process.

  Note

  Note that the NETWORK.INI file already contains an entry for all the possible PCMs, which have been configured with AUTOSTART=NO, so that they will not be loaded by the module enabler when CM/2 is started. Configuring a particular PCM changes the NETWORK.INI entry to AUTOSTART=YES so that this particular PCM will be started by the module enabler at CM startup.

  If this was the first time that this support was configured, the NETWORK.INI file would also have been created.

- A corresponding PCM entry (IBM5853) was added to PROTOCOL.INI by the PCM configuration process. Notice that this entry contains all the characteristics of the specific modem chosen.

Note

In this specific case, we manually altered the SPEED to indicate 1200 instead of the default 2400, because we were using, in effect, an IBM 5841 modem. This would not have been required if we had been using an IBM 5853.

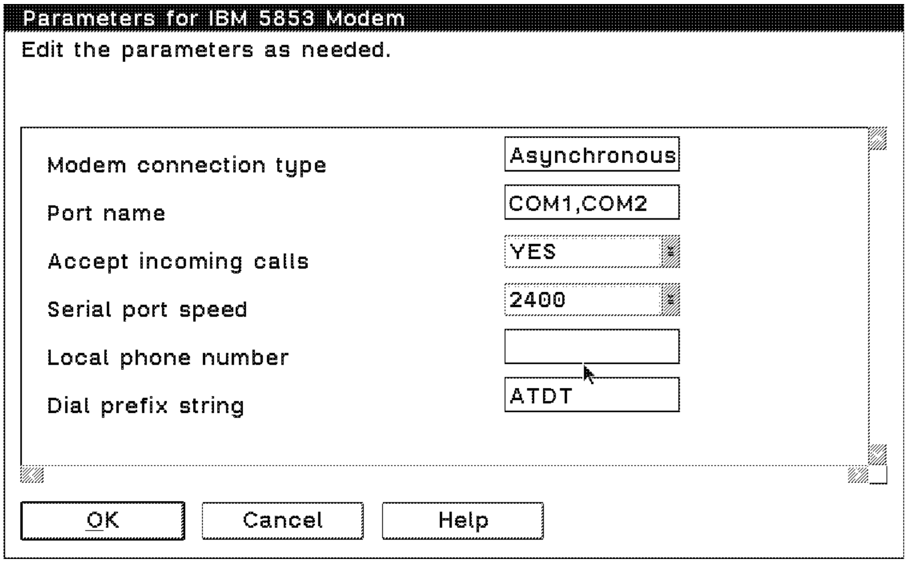
- A MAC entry (ADLCMAC_NIF) was added in PROTOCOL.INI.
- A protocol driver entry (SDLC_SWNET) was added to PROTOCOL.INI by the protocol driver configuration. Notice that this protocol driver has some static bindings to the SDLC virtual MACs (SDLCVMAC0 and SDLCVMAC1).

```
PROTOCOL.INI STATEMENTS                                             CONFIG.SYS STATEMENTS

[PROT_MAN]                                                          DEVICE=C:\IBMCOM\MACS\COMMAC.SYS
   DRIVERNAME = PROTMAN$                                            DEVICE=C:\CMLIB\SDLCSNET.OS2
                                                                    DEVICE=C:\CMLIB\SDLCVMAC.SYS
[SDLC_SWNET]                                     CM/2 Protocol
   DRIVERNAME = SDLCSNET                         Driver Configuration
   BINDINGS = SDLCVMAC0, SDLCVMAC1
   CFGTYPE = Locked

[IBM5853]                                        CM/2 PCM           NETWORK.INI
   DIALOGTYPE = †ATCMD.DDF†                      CONFIGURATION
   SYNCHRONICITY = †Asynchronous†                                   [CXM]
   PORTNAME = COM1                                                     NETWORKTYPE = ANALOG
   ACCPTINCCALL = †NO†
   MODEMCLASS = †Unspecified†                                       [NETWORKDEFS]
   SERIALPORTSPEED = 1200                                              ANALOG = †Analog network†,NETWAE2.SUP
   AUTOBAUDDETECT = †Off†                                                                      ,SNAPHONE.CXM
   FLOWCONTROL = †RTS/CTS†
   PERMCONNECTION = NO                                              [PROT_MAN]
   CFGTYPE = Locked                                                    DRIVERNAME = PROTMAN$
   INITIALIZATION1 = †ATI\CR†
   INITIALIZATION2 = †ATC1E1F1M1Q0V1X1S0=2\CR†                      [ISDN]
   INITIALIZATION3 = †ATC1E1F1M1Q0V1X1S0=0\CR†                         DLL = ACSVSPCM
   DIALPREFIX = †ATDT†                                                 ENTRY = StartVPCM
   DIALSUFFIX = †\CR†                                                  PIF = IBM5853.PIF
   SUCCESS = †OK\CR\LF†                                                PCMNAME = IBM5853
   FAILURE = †ERROR\CR\LF†                                             AUTOSTART = YES
   CONNECTPREFIX = †CONNECT†                                           TITLE = IBM 5853 Modem
   CONNECTSUFFIX = †\CR\LF†
   ESCAPE = †+++†
   HANGUP = †ATH\CR†
   RINGBACK = †RING\CR\LF†                               NOTE: This will be set to YES when you
   BUSY = †BUSY\CR\LF†                                         configure the PCM on the gateway
   NOCARRIER = †NO CARRIER\CR\LF†                              and set accept incoming calls
   NODIALTONE = †NO DIALTONE\CR\LF†                            to YES.
   NOANSWER = †NO ANSWER\CR\LF†
   VOICE = †VOICE\CR\LF†
   RING = †RING\CR\LF†

[IBMLXCFG]
   ADLCMAC_NIF = ADLCMAC.nif

[ADLCMAC_NIF]
   DRIVERNAME = ADLCMAC$
   PORTNAME = †COM1†
   PCMCIA = †NO†
   RX_FIFO_SIZE = 8
   TX_FIFO_SIZE = 8
```

Figure 93. PROTOCOL.INI and NETWORK.INI for SNA over ASYNC

8.4 PCM Configuration for Multiple Ports

If you intend to use more than one port with the same modem, then the same PCM can be configured to manage more than one port. This is done by specifying more than one port name in the PCM configuration, as shown below.



Parameters for IBM 5853 Modem

Edit the parameters as needed.

Modem connection type: Asynchronous
Port name: COM1,COM2
Accept incoming calls: YES
Serial port speed: 2400
Local phone number:
Dial prefix string: ATDT

The following figure illustrates the changes made to the system files when configuring multiple ports. The changes are as follows:

- In the PROTOCOL.INI file, the IBM 5853 Port name now shows COM1,COM2,indicating that this PCM will manage these two ports.
- The PROTOCOL.INI also has a second MAC entry now, called ADLCMAC_NIF2.

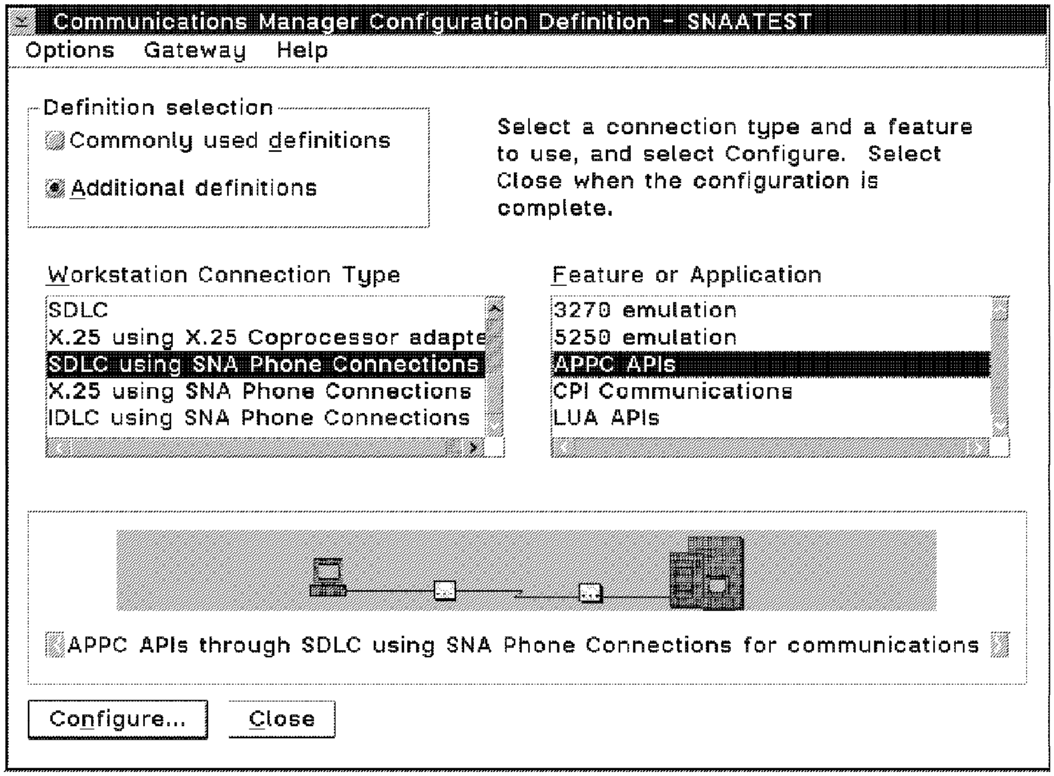
```
PROTOCOL.INI STATEMENTS                                             CONFIG.SYS STATEMENTS

[PROT_MAN]                                                          DEVICE=C:\IBMCOM\MACS\COMMAC.SYS
   DRIVERNAME = PROTMAN$                                            DEVICE=C:\CMLIB\SDLCSNET.OS2
                                                                    DEVICE=C:\CMLIB\SDLCVMAC.SYS
[SDLC_SWNET]                                       CM/2 Protocol
   DRIVERNAME = SDLCSNET                           Driver Configuration
   BINDINGS = SDLCVMAC0, SDLCVMAC1                 Always get the two Virtual Macs, even with one port
   CFGTYPE = Locked

[IBM5853]                                                           NETWORK.INI
   DIALOGTYPE = †ATCMD.DDF†
   SYNCHRONICITY = †Asynchronous†                                   [CXM]
   PORTNAME = COM1,COM2                            From CM/2 PCM       NETWORKTYPE = ANALOG
   ACCPTINCCALL = †NO†                             Configuration
   MODEMCLASS = †Unspecified†                                       [NETWORKDEFS]
   SERIALPORTSPEED = 2400                                              ANALOG = †Analog network†,NETWAE2.SUP
   AUTOBAUDDETECT = †Off†                                                                      ,SNAPHONE.CXM
   FLOWCONTROL = †RTS/CTS†
   PERMCONNECTION = NO                                              [PROT_MAN]
   CFGTYPE = Locked                                                    DRIVERNAME = PROTMAN$
   INITIALIZATION1 = †ATI\CR†
   ......ETC...........                                             [ISDN]
                                                                       DLL = ACSVSPCM
[IBMLXCFG]                                                             ENTRY = StartVPCM
   ADLCMAC_NIF = ADLCMAC.nif            for COM1                       PIF = IBM5853.PIF
   ADLCMAC_NIF2 = ADLCMAC.nif           for COM2                       PCMNAME = IBM5853
                                                                       AUTOSTART = YES
[ADLCMAC_NIF]                           for COM1                       TITLE = IBM 5853 Modem
   DRIVERNAME = ADLCMAC$
   PORTNAME = †COM1†
   PCMCIA = †NO†
   RX_FIFO_SIZE = 8
   TX_FIFO_SIZE = 8

[ADLCMAC_NIF2]                          for COM2
   DRIVERNAME = ADLCMAC$
   PORTNAME = †COM2†
   PCMCIA = †NO†
   RX_FIFO_SIZE = 8
   TX_FIFO_SIZE = 8
```

Figure 94. PROTOCOL.INI and NETWORK.INI for Multiple Ports

8.5 Gateway and Network Node Configuration

Similar to our previous configuration, we do not have a quick configuration process available, especially if we do not want to configure any local 3270 or 5250 emulation session on the gateway/network node.

So this time, we will use the advanced configuration process. On the main configuration panel, we select the radio button “Additional Definitions” in order to get the following panel, on which we select SDLC using SNA Phone Connect as the workstation connection type and APPC APIs as the Feature or Application.



Definition selection
○ Commonly used definitions
● Additional definitions

Select a connection type and a feature to use, and select Configure. Select Close when the configuration is complete.

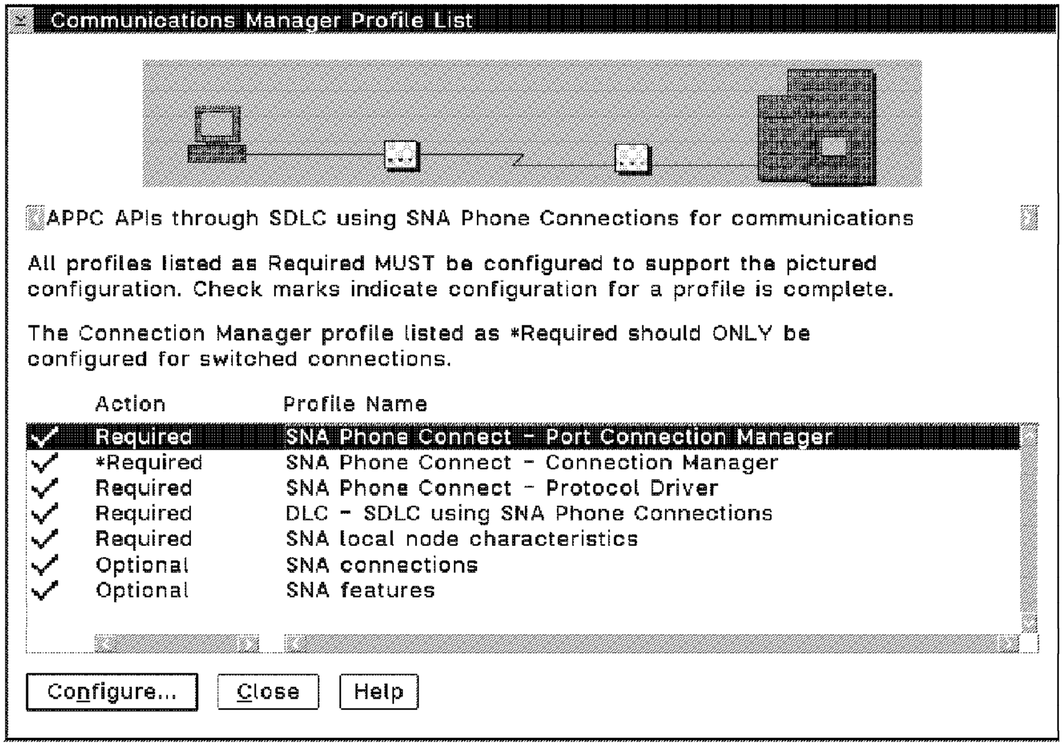
Workstation Connection Type
SDLC
X.25 using X.25 Coprocessor adapte
SDLC using SNA Phone Connections
X.25 using SNA Phone Connections
IDLC using SNA Phone Connections

Feature or Application
3270 emulation
5250 emulation
APPC APIs
CPI Communications
LUA APIs

APPC APIs through SDLC using SNA Phone Connections for communications

Figure 95. CM/2 Additional Definitions Panel

Clicking on Configure displays the panel below:



APPC APIs through SDLC using SNA Phone Connections for communications

All profiles listed as Required MUST be configured to support the pictured configuration. Check marks indicate configuration for a profile is complete.

The Connection Manager profile listed as *Required should ONLY be configured for switched connections.

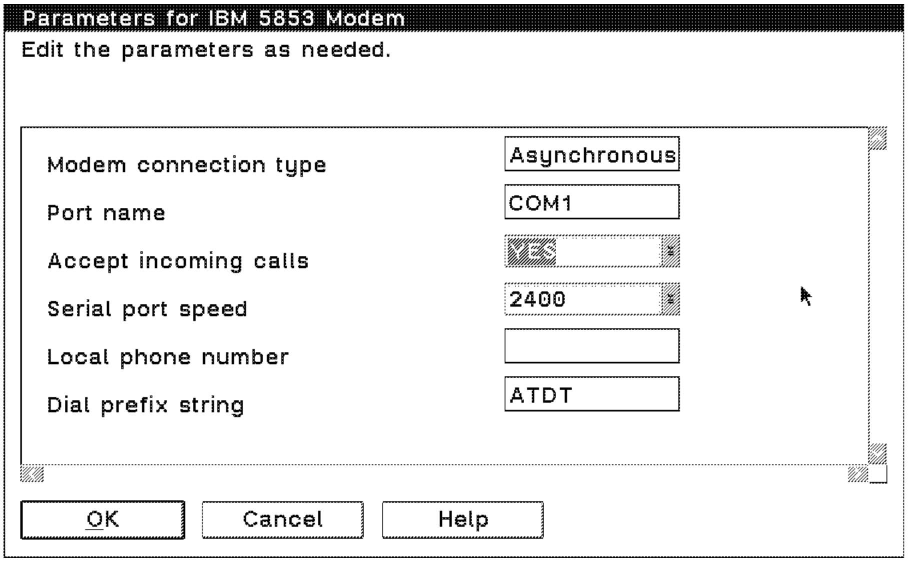
	Action	Profile Name
✓	Required	SNA Phone Connect - Port Connection Manager
✓	*Required	SNA Phone Connect - Connection Manager
✓	Required	SNA Phone Connect - Protocol Driver
✓	Required	DLC - SDLC using SNA Phone Connections
✓	Required	SNA local node characteristics
✓	Optional	SNA connections
✓	Optional	SNA features

Figure 96. CM/2 Profile List

8.5.1 Port Connection Manager Configuration - Network Node

For the Port Connection Manager profile, we select asynchronous switched as the modem connection type, and IBM5853 as the PCM. The PCM configuration screen will be as shown below, where we specify Accept Incoming Calls as YES.

In this case, we want to set up an implicit definition for downstream workstations that will dial-in over an asynchronous link. The only important difference from what we have already configured on the end node is that we will want to enable incoming calls by setting our modem for auto-answer.



Edit the parameters as needed.

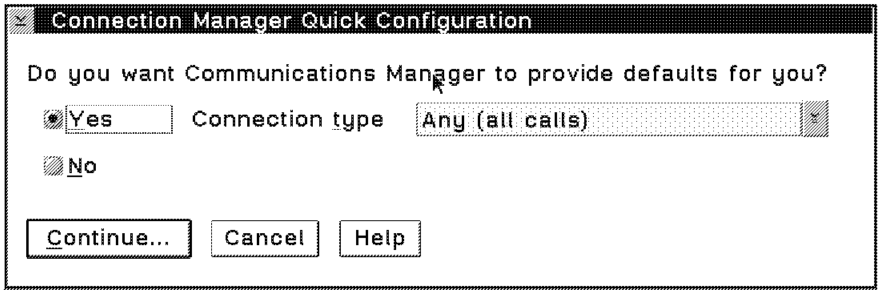
Modem connection type: Asynchronous
Port name: COM1
Accept incoming calls: YES
Serial port speed: 2400
Local phone number:
Dial prefix string: ATDT

Figure 97. IBM5853 PCM Configuration Panel

8.5.2 Connection Manager Configuration - Network Node

Since this workstation will be accepting calls from downstream workstations, we require an incoming call directory entry to be configured in the Connection Manager profile.

On the main Connection manager panel, we select **Create** in the Incoming Call Directory Entries section, to get the following panel:



Do you want Communications Manager to provide defaults for you?

● Yes Connection type: Any (all calls)

○ No

Figure 98. Incoming Call Directory Entry Defaults

We accept the defaults so we just click on **Continue**.

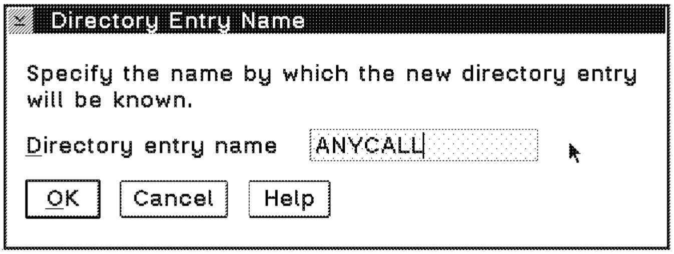

Directory Entry Name
Specify the name by which the new directory entry will be known.
Directory entry name
ANYCALL
OK
Cancel
Help

Figure 99. Incoming Call Directory Entry Name

On this panel, we use the name ANYCALL for this incoming call directory entry, and click on **OK**. This brings us back to the main Connection Manager panel where we should see our ANYCALL entry appear under the incoming entries, as shown below:

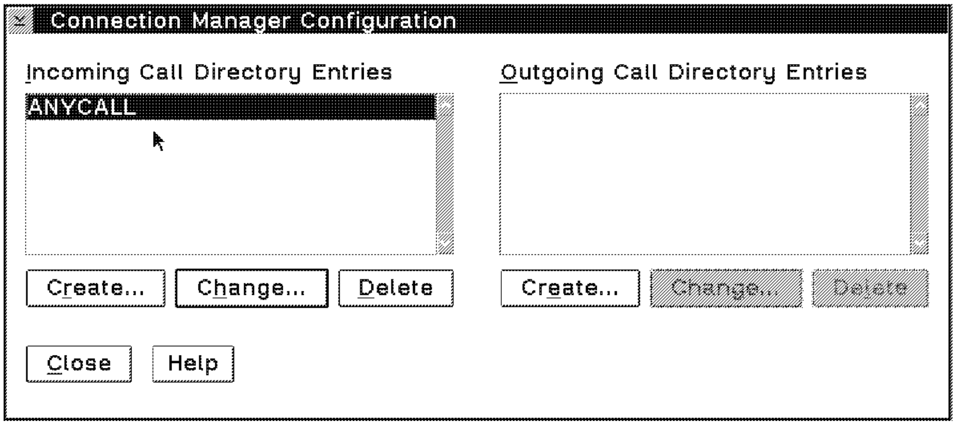

Connection Manager Configuration
Incoming Call Directory Entries
ANYCALL
Outgoing Call Directory Entries
Create...
Change...
Delete
Create...
Change...
Delete
Close
Help

Figure 100. Connection Manager Main Panel

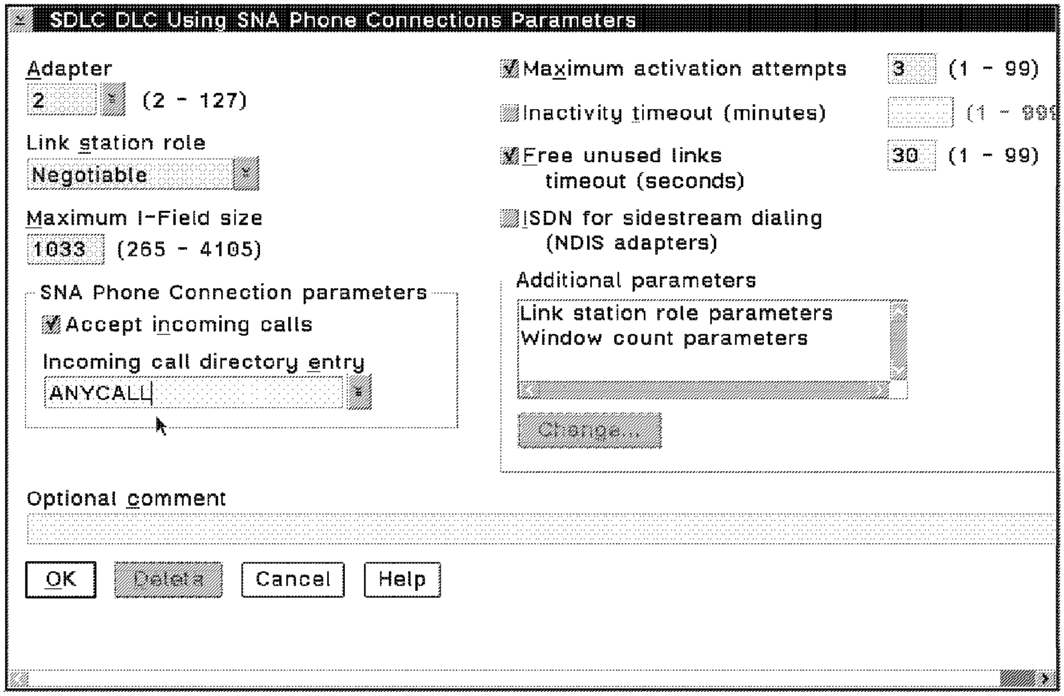
We then close the Connection Manager panel to get back to the profile list.

8.5.3 Protocol Driver Configuration - Network Node

Select the Protocol Driver profile, click on **Configure** and then just answer YES. This is all that′s required on this profile.

8.5.4 SDLC DLC Using SNA Phone Connect - Network Node

We are now in a position to configure the DLC for SDLC Using SNA Phone Connect profile, as shown below, where we specify that this DLC is to accept incoming calls, and it is to use the entry ANYCALL to do so. This ANYCALL entry is selectable from the list box once you check the Accept Incoming Calls check box.



SDLC DLC Using SNA Phone Connections Parameters

Adapter: 2 (2 - 127)

Link station role: Negotiable

Maximum I-Field size: 1033 (265 - 4105)

SNA Phone Connection parameters

☑ Accept incoming calls

Incoming call directory entry: ANYCALL

☑ Maximum activation attempts: 3 (1 - 99)

☐ Inactivity timeout (minutes): (1 - 99

☑ Free unused links timeout (seconds): 30 (1 - 99)

☐ ISDN for sidestream dialing (NDIS adapters)

Additional parameters:
Link station role parameters
Window count parameters

Optional comment

Figure 101. DLC - SDLC Using SNA Phone Connect

At this point, we are pretty well finished with the items related to SNA Phone Connect. We will need to remember to alter the PCM entry in PROTOCOL.INI for the speed of the modem, like we did previously, but, apart from this, the rest has mainly to do with the gateway configuration.

8.5.5 Local Node Characteristics - Network Node

On this profile, choose the name that have been assigned to you by your network administrator, but make sure that you select the entry **Network Node** as the node type.

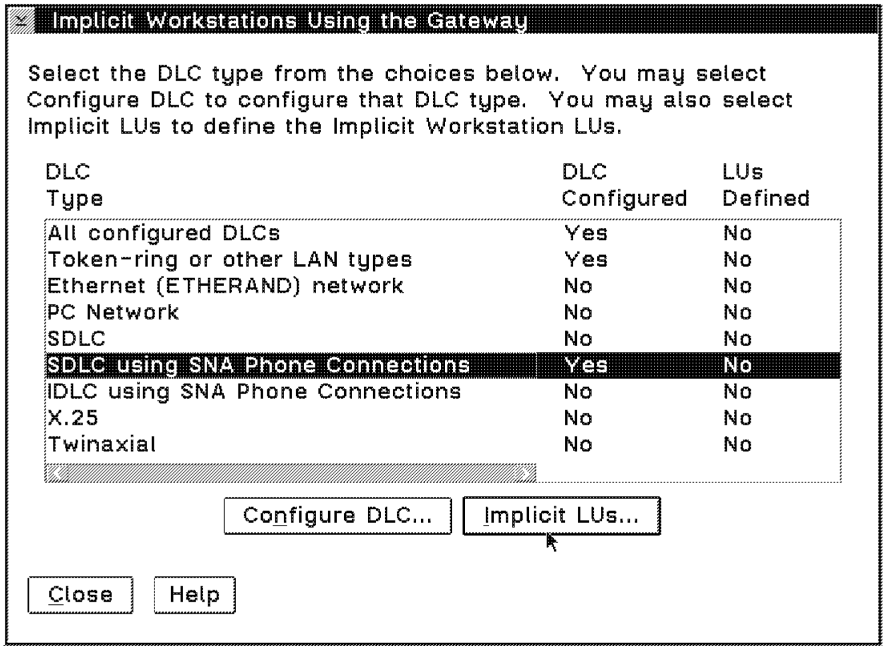
At this point, you can click on Close, on the Profiles list panel, in order to come back to the main configuration panel. At that point, use the gateway pull-down on the menu bar, and configure, in order to get a list of the gateway related profiles.

8.5.6 Gateway - Hosts and Hosts LU Pools

Remember that you must define here the hosts connections and the LU pools which are to be used by the downstream workstations. In our example, we have created a host link called HOST0001 and an LU pool called POOLA.

8.5.7 Implicit Workstation Using the Gateway

We have then used this profile to define the parameters for implicit workstations to dial-in, over an SNA Phone Connect connection. On the first panel, shown below, we selected SDLC using SNA Phone Connections as the DLC type



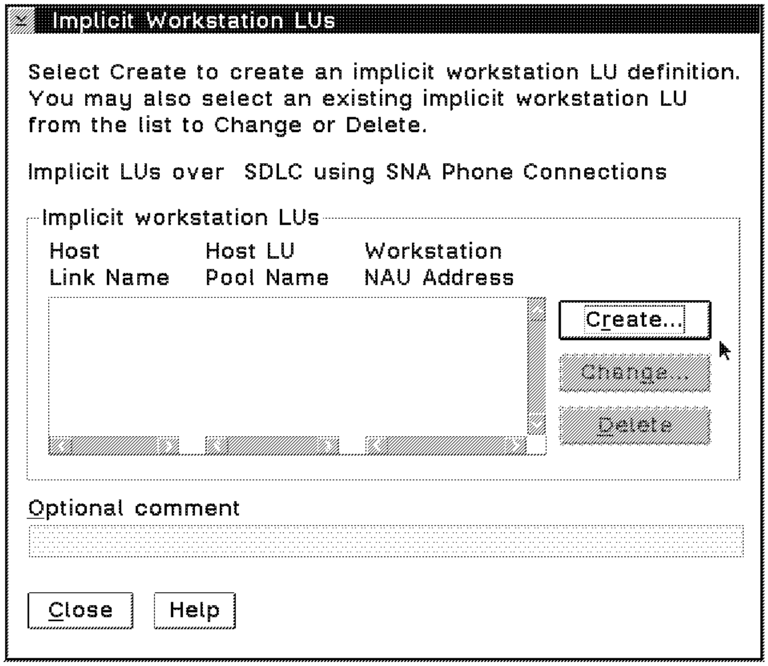
Implicit Workstations Using the Gateway

Select the DLC type from the choices below. You may select Configure DLC to configure that DLC type. You may also select Implicit LUs to define the Implicit Workstation LUs.

DLC Type	DLC Configured	LUs Defined
All configured DLCs	Yes	No
Token-ring or other LAN types	Yes	No
Ethernet (ETHERAND) network	No	No
PC Network	No	No
SDLC	No	No
SDLC using SNA Phone Connections	Yes	No
IDLC using SNA Phone Connections	No	No
X.25	No	No
Twinaxial	No	No

Figure 102. Implicit Workstations Panel

We then click on **Implicit LUs** to define these LUs, which brings us the panel below:



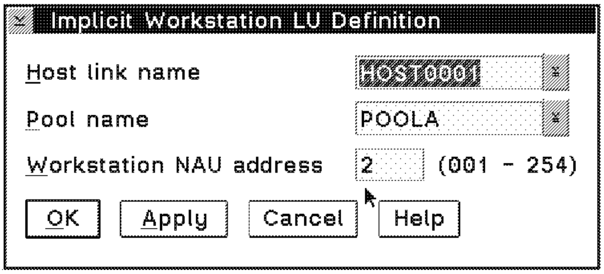
Implicit Workstation LUs

Select Create to create an implicit workstation LU definition. You may also select an existing implicit workstation LU from the list to Change or Delete.

Implicit LUs over SDLC using SNA Phone Connections

Figure 103. Implicit Workstations LUs

Here we click on Create in order to get this panel:



Implicit Workstation LU Definition

Host link name: HOST0001

Pool name: POOLA

Workstation NAU address: 2 (001 - 254)

Figure 104. Implicit Workstations LU Definition

Here we configured for any workstation, coming in with an LU with NAU 2, to be assigned to POOLA on HOST0001 link.

Chapter 9. Configuration Example - ThinkPad with a PCMCIA Autosync Modem to a 3745

This chapter describes the configuration setup for 3270 emulation from a ThinkPad 720 using a PCMCIA autosync modem to a 3745.

The setup is as shown in Figure 105.

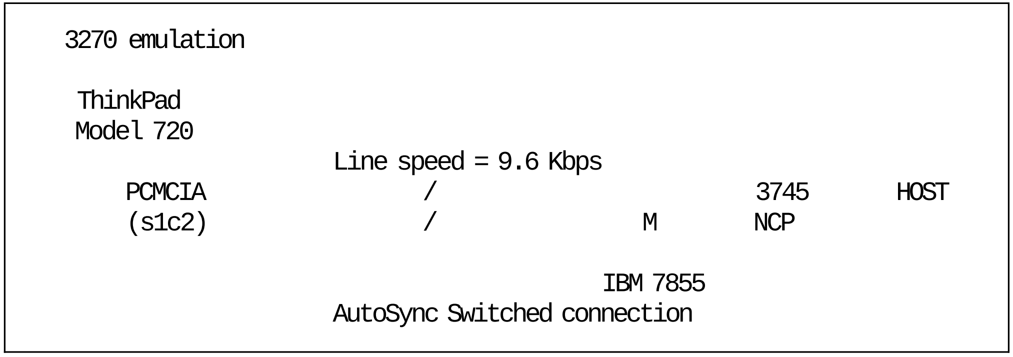


Figure 105. 3270 Emulation using a PCMCIA autosync modem to a 3745

The equipment used is as follows:

- ThinkPad Model 720
- IBM DATA/FAX Modem PCMCIA (purple writing on a black background)
- One IBM 7855 Model 10 modem connected to a 3745
- 3745 Model 170

Note

This chapter only explains the CM/2 configuration process for a specific scenario. Refer to Chapter 1, "SNA Phone Connect Overview" on page 1 and Chapter 2, "CM/2 SNA Phone Connect Configuration" on page 11 for more general configuration information. Make sure that you have installed LAPS level WR07020 or above before configuring SNA Phone Connect.

9.1 Special Considerations for PCMCIA

To be able to use SNA Phone Connect on a ThinkPad with a PCMCIA Data/Fax modem, you need to install all the required device drivers for the PCMCIA adapters.

The following list describes all the device drivers that need to be installed, and in which order, in your CONFIG.SYS file:

1. **PCMCIA.SYS**

   This is the PCMCIA card services device driver. It is shipped as part of OS/2 2.1 or above.

2. **VPCMCIA.SYS**

   This is an optional PCMCIA card device driver for virtual DOS. It is shipped as part of OS/2 2.1 or above and is used only for DOS applications under

© Copyright IBM Corp. 1995

OS/2; however it does no do any harm to have it in CONFIG.SYS even if it is not needed.

3. **COM.SYS**

   This is the COM port device driver. It is shipped as part of OS/2 as well.

4. **Modem**

   This will vary depending on the modem you are using. For example, for an IBM PCMCIA Data/Fax modem, this would be **ESTDFM.OS2**. This device driver should come with your PCMCIA card when you purchase it.

   You also need to be sure to configure the appropriate device driver parameters, that is slot number and COM port number. Refer to the sample CONFIG.SYS in 9.4.1, "CONFIG.SYS" on page 123.

5. **$ICPMOS2.SYS** #

   This is a PCMCIA power management device driver.

6. **IBM2SSxx.SYS** #

   This is the socket services device driver.

7. **ICRMUxx.SYS** #

   This is a hardware resource management device driver.

(Note: Substitute xx with 01 for AT-bus or 02 for Micro Channel.)

The last three device drivers (those marked with # above) are shipped with IBM PCMCIA compatible systems on the PCMCIA device driver diskette.

9.2 Using PlayAtWill

There are software packages which provide device drivers for PCMCIA adapters; one of these, for example, is called PlayAtWill, and others are EasyPlay, or Plug+Play. If you have one of these products installed, then there is no need to install a modem device driver, such as ESTDFM.OS2, because the product will supply the equivalent device driver.

There is only one line different in your CONFIG.SYS when using PlayAtWill. The modem device driver statement, that is `ESTDFM.OS2`, is replaced with `DEVICE=C:\THINKPAD\AUTODRV2.SYS C:\THINKPAD\AUTODRV2.INI`.

Illustrated below is the PlayAtWill window:

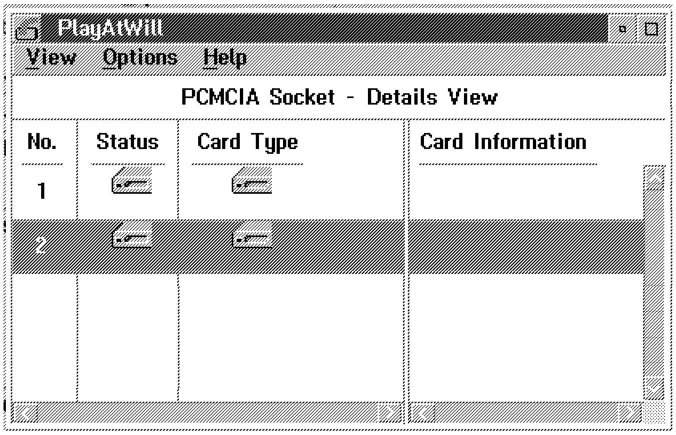


Figure 106. PlayAtWill

The figure above shows that there are no PCMCIA adapter cards inserted, at the moment, on this ThinkPad. Notice that there are 2 entries for the 2 slots in the ThinkPad. Slot 1 is the upper slot and slot 2 is the lower slot, and both appear as empty.

PlayAtWill provides the modem device driver and also automatically configures the port name to be used. Then, when you configure the Port Connection Manager in CM/2, you use the same port name as configured by PlayAtWill, that is COM2, or COM3, etc.

The figure below shows the PlayAtWill window when a PCMCIA modem is inserted in slot 1. Notice that the *status* of the card, is *OK*. The *Card Information* area shows the *port name* to which this PCMCIA adapter card is assigned (in this figure it is *COM2*). Make sure you use this port name when configuring the Port Connection Manager in the CM/2 configuration.

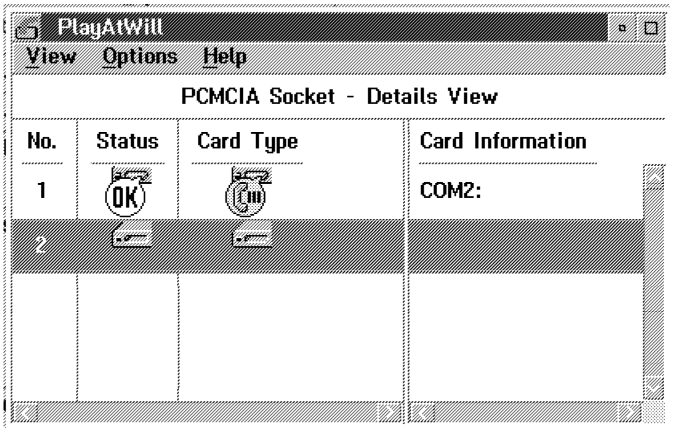


Figure 107. PlayAtWill with One PCMCIA Inserted

With PlayAtwill installed, you can plug and unplug the PCMCIA card as long as CM/2 is not started. Do not try to plug and unplug the card while CM/2 is up as this can cause problems.

PlayAtWill refreshes the window shown above when you plug and unplug PCMCIA adapter cards. However, one should exercise caution when using more than one PCMCIA adapter card. The *Card Information*, that is, the *port name* is automatically assigned when you insert the card. So, if you insert a card into slot 2 first, and then another into slot 1, COM2 will be assigned to slot 2 and COM3 to slot 1. If it happens that the PCMCIA modem card that you are using for SNA Phone Connect is inserted into slot 1 and is assigned to COM3 with IRQ 5, then there will be a problem if you are using an AT-bus machine, since SNA Phone Connect will only work using IRQ 3 or 4.

You can select the slot number where your PCMCIA card is inserted and double click on card information, that is **COM2** for example, to see what IRQ level is assigned to this COM port.

Important

Be aware of the COM port, and IRQ level configured by using PlayAtWill on an AT-bus ThinkPad, since SNA Phone Connect will only work using IRQ 3 or 4. You can disable the internal serial port for your system using the reference diskette. Therefore you should be able to use COM2 with IRQ 3 for example.

Make sure that the port name assigned is the same as the port name configured in your Port Connection Manager.

CM/2 will return an error such as “PCM could not access port COM3 because the hardware is not properly configured or is missing,” when PlayAtWill configures the PCMCIA card as COM3 with IRQ 5.

9.3 CM/2 Configuration Process

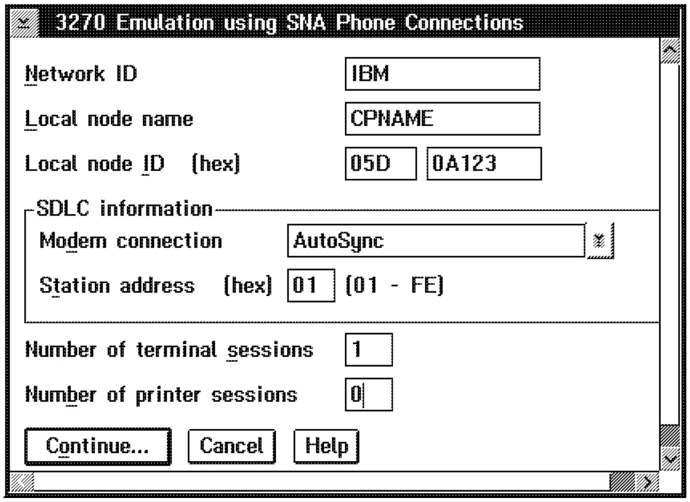
1. Start the Communications Manager Setup and select **Setup**. Select the configuration file name that will be used, or create a new one, for example, “HOST3270,” as used in this scenario. Then continue to the Communications Manager Configuration Definition window.

   Note

   If you are updating an existing configuration file the sequence of windows that you see may differ from what is shown here. This scenario assumes you are creating a new configuration file.

   As well, if the radio button in the Definitions Selection box is set to “Additional Definitions,” set it to “Commonly Used Definitions” in order to get a list of commonly used definitions to choose from.

2. Select **3270 Emulation using SNA Phone Connections**, from the Commonly Used Definitions list and then click on **Configure**, to display the following window, and enter the required fields:



Network ID: IBM

Local node name: CPNAME

Local node ID (hex): 05D 0A123

SDLC information

Modem connection: AutoSync

Station address (hex): 01 (01 - FE)

Number of terminal sessions: 1

Number of printer sessions: 0

Figure 108. 3270 Emulation Using SNA Phone Connections

- **Network ID**

  In this scenario it can be any name you like, although this is usually provided to you by your network administrator since each organization has naming conventions that need to be followed.

- **Local node name**

  The local node name is your Control Point LU name, but in this scenario, it can be anything you like since we will not be using this LU as an APPC LU.

- **Local node ID (hex)**

  This value should match the IDBLK/IDNUM on the host NCP configuration definition, which in this case is 05D 0A123.

- **SDLC information**

  – Modem connection

    Select **AutoSync** from the list box.

  – Station address (hex)

    In this scenario the station address can be any value, since it is a switched connection.

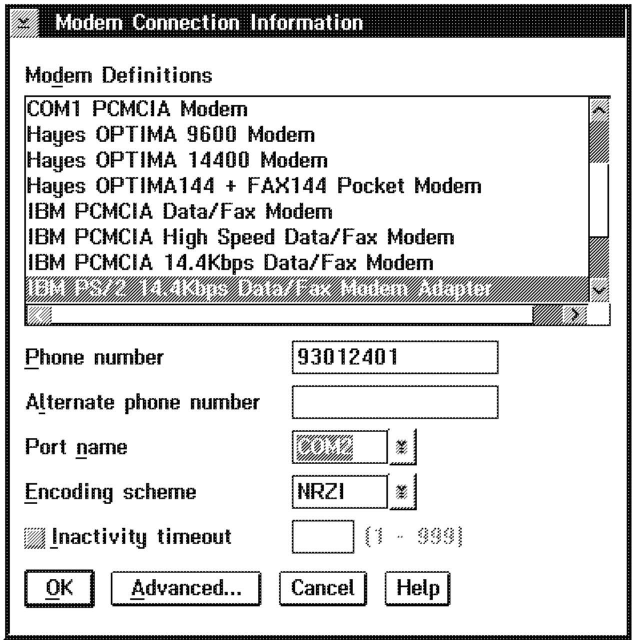
- **Number of terminal sessions**

  Can be any number from 0 to 26, however the total number of terminal sessions cannot be more than 26.

- **Number of printer sessions**

  Can be any number from 0 to 26, however the total number of terminal and printer sessions cannot be more than 26.

3. Select **Continue** to get the second quick configuration window, as displayed below, and enter the required fields.



Modem Connection Information

Modem Definitions

COM1 PCMCIA Modem
Hayes OPTIMA 9600 Modem
Hayes OPTIMA 14400 Modem
Hayes OPTIMA144 + FAX144 Pocket Modem
IBM PCMCIA Data/Fax Modem
IBM PCMCIA High Speed Data/Fax Modem
IBM PCMCIA 14.4Kbps Data/Fax Modem
IBM PS/2 14.4Kbps Data/Fax Modem Adapter

Phone number: 93012401

Alternate phone number:

Port name: COM2

Encoding scheme: NRZI

☐ Inactivity timeout: (1 - 999)

Figure 109. Modem Connection Information

- **Modem Definitions**

  In this scenario **IBM PCMCIA 14.4 Kbps Data/Fax Modem** is used.

- **Phone number**

  Enter the telephone number required to dial to the 3745.

- **Alternate phone number**

  This is optional. It is the number that will be dialed when the primary number is busy or not available.

- **Port name**

  The default value is COM1. Notice that for ThinkPads, COM1 is usually assigned to the built-in serial port; therefore you need to make sure that you use the right COM number. This scenario uses COM2.

  Make sure that you have the right slot number and COM port number defined on your modem device driver in CONFIG.SYS.

- **Encoding scheme**

  NRZI is used in this scenario since NRZI was defined in the NCP configuration.

  The default encoding scheme in an NCP configuration is NRZI. It is recommended to use NRZI, since NRZI is a better encoding scheme than NRZ to avoid the loss of clock synchronization between modems for extended sequences of zero-bit data.

- **Inactivity timeout**

  Do not select Inactivity timeout unless you want the link to be taken down automatically after a certain period of inactivity.

  When the Inactivity timeout field is selected a number should be entered between 1 - 999 (minutes). The inactivity timeout limits the amount of time a link can be unused or idle before it is automatically disconnected.

4. Select **OK** to end the configuration.

9.4 Related Files

In this section, we illustrate some changes and additions that have been made, by this configuration, to some of the system files. This may be handy if you need to verify that your configuration was indeed successful and produced the same results as ours.

9.4.1 CONFIG.SYS

This is a sample of the CONFIG.SYS file used in this scenario.

```
DEVICE=C:\IBMCOM\LANMSGDD.OS2 /I:C:\IBMCOM
DEVICE=C:\CMLIB\R0CSDD.SYS
DEVICE=C:\CMLIB\GENMSGDD.OS2
RUN=C:\CMLIB\GENMSGEX.EXE
DEVICE=C:\IBMCOM\PROTMAN.OS2 /I:C:\IBMCOM
DEVICE=C:\CMLIB\ACSVPCM.OS2
IFS=C:\OS2\HPFS.IFS  /CACHE:64 /CRECL:4
PROTSHELL=C:\OS2\PMSHELL.EXE
SET USER_INI=C:\OS2\OS2.INI
SET SYSTEM_INI=C:\OS2\OS2SYS.INI
SET OS2_SHELL=C:\OS2\CMD.EXE
SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,CONNECTIONS
SET RUNWORKPLACE=C:\OS2\PMSHELL.EXE
SET COMSPEC=C:\OS2\CMD.EXE
LIBPATH=C:\IBMCOM\DLL;.;C:\OS2\DLL;C:\CMLIB\DLL;C:\OS2\MDOS;C:\;
C:\OS2\APPS\DLL;
SET PATH=C:\OS2;C:\CMLIB;C:\OS2\SYSTEM;C:\OS2\MDOS\WINOS2;C:\OS2\INSTALL;
C:\;C:\OS2\MDOS;C:\OS2\APPS;
SET DPATH=C:\IBMCOM;C:\OS2;C:\CMLIB;C:\OS2\SYSTEM;C:\OS2\MDOS\WINOS2;
C:\OS2\INSTALL;C:\;C:\OS2\BITMAP;C:\OS2\MDOS;C:\OS2\APPS;
SET PROMPT=$i[$p]
SET HELP=C:\OS2\HELP;C:\OS2\HELP\TUTORIAL;C:\CMLIB;
SET GLOSSARY=C:\OS2\HELP\GLOSS;
SET IPF_KEYS=SBCS
PRIORITY_DISK_IO=YES
FILES=20
DEVICE=C:\OS2\TESTCFG.SYS
DEVICE=C:\OS2\DOS.SYS
DEVICE=C:\OS2\PMDD.SYS
BUFFERS=30
IOPL=YES
DISKCACHE=1024,LW,AC:C
MAXWAIT=3
MEMMAN=SWAP,PROTECT
SWAPPATH=C:\OS2\SYSTEM 2048 2048
BREAK=OFF
THREADS=256
PRINTMONBUFSIZE=134,134,134
COUNTRY=001,C:\OS2\SYSTEM\COUNTRY.SYS
SET KEYS=ON
BASEDEV=PRINT02.SYS
BASEDEV=IBM2FLPY.ADD
BASEDEV=IBM2ADSK.ADD
BASEDEV=IBM2SCSI.ADD /LED
BASEDEV=IBMINT13.I13
BASEDEV=OS2DASD.DMD
```

```
SET BOOKSHELF=C:\OS2\BOOK;
SET EPMPATH=C:\OS2\APPS;
PROTECTONLY=NO
SHELL=C:\OS2\MDOS\COMMAND.COM C:\OS2\MDOS
FCBS=16,8
RMSIZE=640
DEVICE=C:\OS2\MDOS\VEMM.SYS
DOS=LOW,NOUMB
DEVICE=C:\OS2\MDOS\VDPX.SYS
DEVICE=C:\OS2\MDOS\VXMS.SYS /UMB
DEVICE=C:\OS2\MDOS\VDPMI.SYS
DEVICE=C:\OS2\MDOS\VCDROM.SYS
DEVICE=C:\OS2\MDOS\VWIN.SYS
DEVICE=C:\OS2\APM.SYS
DEVICE=C:\OS2\PWRMGMT.SYS
DEVICE=C:\OS2\MDOS\VAPM.SYS
DEVICE=C:\OS2\PCMCIA.SYS   1
DEVICE=C:\OS2\MDOS\VPCMCIA.SYS   2
DEVICE=C:\OS2\MDOS\VMOUSE.SYS
DEVICE=C:\OS2\POINTDD.SYS
DEVICE=C:\OS2\MOUSE.SYS
DEVICE=C:\OS2\MDOS\VCOM.SYS
CODEPAGE=437,850
DEVINFO=KBD,US,C:\OS2\KEYBOARD.DCP
DEVINFO=SCR,VGA,C:\OS2\VIOTBL.DCP
SET VIDEO_DEVICES=VIO_SVGA
SET VIO_SVGA=DEVICE(BVHVGA,BVHSVGA)
DEVICE=C:\OS2\MDOS\VSVGA.SYS
DEVICE=C:\OS2\COM.SYS   3
DEVICE=C:\IBMODEM\ESTDFM.OS2 S1C2   4
SET CMPATH=C:\CMLIB
DEVICE=C:\OS2\LOG.SYS
RUN=C:\OS2\SYSTEM\LOGDAEM.EXE
DEVICE=C:\OS2\EPWDD.SYS
RUN=C:\OS2\EPWDDR3.EXE
RUN=C:\OS2\EPWROUT.EXE 1
RUN=C:\OS2\EPW.EXE
RUN=C:\IBMCOM\PROTOCOL\NETBIND.EXE
RUN=C:\IBMCOM\LANMSGEX.EXE
DEVICE=C:\OS2\$ICPMOS2.SYS  5
DEVICE=C:\OS2\IBM2SS02.SYS  6
DEVICE=C:\OS2\ICRMU02.SYS  7
DEVICE=C:\CMLIB\SDLCSNET.OS2  8
DEVICE=C:\CMLIB\SDLCVMAC.SYS  9
DEVICE=C:\CMLIB\CMKFMDE.SYS  10
DEVICE=C:\IBMCOM\MACS\HAMMAC.SYS  11
```

Brief explanation of each statement:

Label	Description
1	PCMCIA card services device driver
2	PCMCIA card services device driver for virtual DOS, optional
3	COM port device driver
4	Modem device driver with parameter S1C2, specifying that the PCMCIA is inserted in slot 1 on COM2 (Slot 1 is the upper slot. Notice that COM1 is used by the built-in serial port.)
5	PCMCIA power management device driver

6	PCMCIA socket services device driver
7	Hardware resource management device driver
8	SDLC Protocol device driver added by CM/2 SNA Phone Connect configuration
9	SDLC Virtual MAC device driver added by CM/2 SNA Phone Connect configuration
10	Device driver added by CM/2 SNA Phone Connect configuration
11	AutoSync device driver added by CM/2 SNA Phone Connect configuration

There is only one line different in your CONFIG.SYS when using PlayAtWill. The modem device driver statement (that is 4 above) is replaced by `DEVICE=C:\THINKPAD\AUTODRV2.SYS C:\THINKPAD\AUTODRV2.INI`. Therefore, you could just `REM` out this statement if you do not want to use PlayAtWill, and reinstall your modem device driver instead.

However all other device drivers, that is 1 , 2 , 3 , 4 , 5 , 6 , 7 would also be replaced by the drivers that come with PlayAtWill.

9.4.2 PROTOCOL.INI

In PROTOCOL.INI, you should see an entry for the AIBMPCM Port Connection Manager, along with an entry for the Autosync MAC driver (HAMMAC_NIF) and the SDLC protocol driver for a switched network (SDLC_SWNET).

```
[PROT_MAN]

   DRIVERNAME = PROTMAN$

[AIBMPCM]

   DIALOGTYPE = †HAMCMD.DDF†
   SYNCHRONICITY = †AutoSync†
   PORTNAME = COM2
   ACCPTINCCALL = †NO†
   MODEMCLASS = †Unspecified†
   SERIALPORTSPEED = 38400
   AUTOBAUDDETECT = †Off†
   FLOWCONTROL = †RTS/CTS†
   PERMCONNECTION = NO
   CFGTYPE = Locked
   ENCODINGSCHEME = †NRZI†
   INITIALIZATION1 = †ATI\CR†
   INITIALIZATION2 = †ATE1L2Q0V1M1X4Y0&C1&D2&K3&Q4&S1\\G0\\J0S0=2\CR†
   INITIALIZATION3 = †ATE1L2Q0V1M1X4Y0&C1&D2&K3&Q4&S1\\G0\\J0S0=0\CR†
   INITIALIZENRZI = †ATS19=2\CR†
   INITIALIZENRZ = †ATS19=10\CR†
   DIALPREFIX = †ATDT†
   DIALSUFFIX = †\CR†
   SUCCESS = †OK\CR\LF†
   FAILURE = †ERROR\CR\LF†
   CONNECTPREFIX = †CONNECT†
   CONNECTSUFFIX = †\CR\LF†
   ESCAPE = †+++†
   HANGUP = †ATH\CR†
   RINGBACK = †RING\CR\LF†
   BUSY = †BUSY\CR\LF†
   NOCARRIER = †NO CARRIER\CR\LF†
   NODIALTONE = †NO DIALTONE\CR\LF†
   NOANSWER = †NO ANSWER\CR\LF†
   VOICE = †VOICE\CR\LF†
   RING = †RING\CR\LF†

[SDLC_SWNET]

   DRIVERNAME = SDLCSNET
   BINDINGS = SDLCVMAC0, SDLCVMAC1
   CFGTYPE = Locked

[IBMLXCFG]

   HAMMAC_nif = HAMMAC.NIF

[HAMMAC_nif]

   DriverName = HAMMAC$
   PORTNAME = †COM2†
   PCMCIA = †YES†
   RX_FIFO_SIZE = 14
   TX_FIFO_SIZE = 14
```

9.4.3 NETWORK.INI

The NETWORK.INI file will be updated to change the autostart parameter to **YES** for the IBM PCMCIA 14.4 Kbps Data/FAX Modem entry as follows:

```
DLL = ACSVSPCM
ENTRY = StartVPCM
PIF = AIBMPCM.PIF
PCMNAME = AIBMPCM
AUTOSTART = YES
TITLE = IBM PCMCIA 14.4Kbps Data/Fax Modem
```

9.4.4 Example of Host Parameters Used for This Scenario (3745)

```
 GROUPSW  GROUP LNCTL=SDLC,
          DIAL=YES,
          NEWSYNC=NO,
          NRZI=YES,
          PAUSE=1,
          RETRIES=(7,4,5)
 DIALA    LINE ADDRESS=(26,HALF),
          NPACOLL=YES,
          OWNER=RAK,
          CLOCKNG=EXT,
          DUPLEX=HALF,
          RETRIES=(5,10,3),
          SPEED=2400,
          ANSWER=ON,
          CALL=INOUT,
          ISTATUS=ACTIVE

HCTR1000  PU ADDR=01,IDBLK=05D,PUTYPE=2,IDNUM=0A123,
             CPNAME=HCXP1000,MODETAB=MT3278SD,DLOGMOD=T3278GD,
                    SSCPFM=USSSCS,ANS=CONT,
                    ISTATUS=ACTIVE,USSTAB=USSTBSTD,
                    MAXDATA=1033,MAXOUT=7,PACING=2,VPACING=8
HWSV0000  LU LOCADDR=2                                     3270
HWSA0000  LU LOCADDR=3                                     3270
HWSB0000  LU LOCADDR=4                                     3270
HWSC0000  LU LOCADDR=5                                     3270
HWSP0000  LU LOCADDR=6,DLOGMOD=DSC2K,LOGAPPL=              PRINTER
```

Note

The NCP parameter SPEED=2400, is used for lines with internal clocks and to calculate the weight of the LIC used. It is also used for problem determination wrap tests, in which case it should match the clock speed of the modem. For all other operational aspects the modem clock will be what determines the speed used.

The speed parameter is used to calculate the line utilization as well.

Chapter 10. Communications Terminology and Tutorial

Since the SNA Phone Connect feature deals with many types of telephone lines, modems, synchronous and asynchronous circuits, etc., we thought that a brief high-level tutorial on some of the basic communications concepts involved might be appropriate. This is mainly for the benefit of those readers for whom this may be totally new or for those who might need a refresh on some long forgotten terminology.

Most communication lines in existence today have not been designed to transmit the digital data signals produced by computers, but only to transmit voice signals, which are analog signals.

Therefore, the digital signals that computers use must be modified in such a way as to be carried over analog lines.

The way in which this is accomplished is through the use of a special piece of equipment that converts digital signals into analog signals, and then back into digital signals at the other end of the connection. This equipment is called a MODEM, which stands for MODulator/DEModulator, in the sense that it modulates a digital signal onto an analog waveform and demodulates a digital signal from an analog waveform.

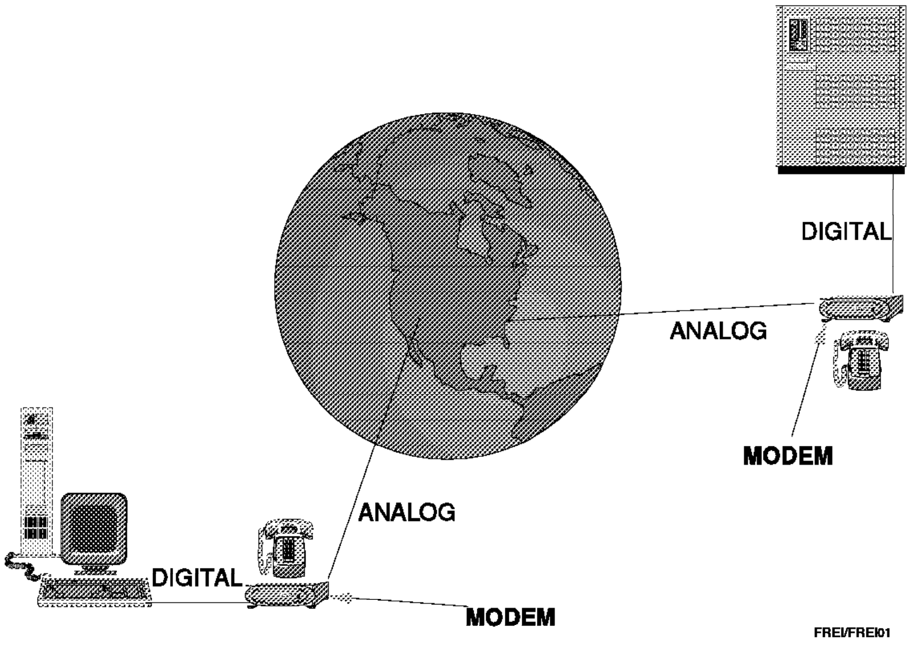


Figure 110. Digital/Analog Communications and the Role of the Modem

© Copyright IBM Corp. 1995

10.1 Half-Duplex/Full-Duplex Transmissions

What about half-duplex and full-duplex? You might say to yourself, ″I often hear these terms used when talking about communications circuits, but I never quite understood their importance.″

10.1.1 Half-Duplex

Half-duplex is a transmission between two stations in both directions but not simultaneously, as illustrated by the following analogy of trucks crossing a one-lane bridge:

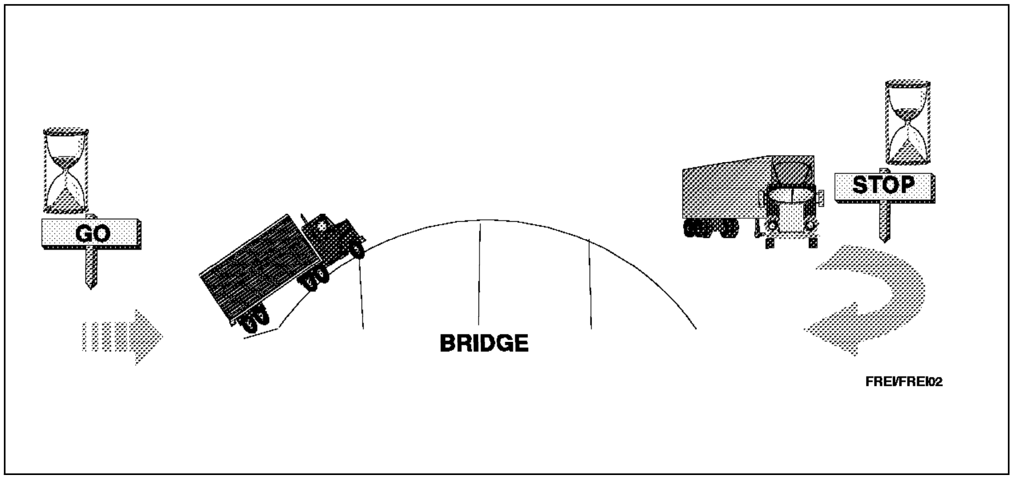


Figure 111. Half-Duplex

- In half-duplex communications, when a station changes from transmit to receive or from receive to transmit, there is a delay called the ″Line turnaround time″. This delay is necessary to allow modems and network components to switch the direction of transmission on the line.
- The total line turnaround time can increase significantly when using short interactive transactions since the line will be turned around on each transaction.

10.1.2 Full-Duplex

Full-duplex or duplex transmission is a transmission between two stations in both directions simultaneously. A duplex line, as illustrated in Figure 112 on page 131 can transmit in both directions simultaneously. If a duplex line is used, the modems and network equipment are always ready to transmit and receive and the line turnaround is minimal.

When referring to full and half-duplex communication, keep the following in mind:

- Some equipment only work in half-duplex mode (3174 for example) while other equipment can operate in both (3745 for example).
- Some line protocols are half-duplex (BSC for example) and others full-duplex (HDLC for example).
- The terms full-duplex and half-duplex are sometimes erroneously used to mean ″4 wires″ and ″2 wires″; this is an error because the number of wires used in the communication line is not really related to half-duplex or full-duplex capabilities.

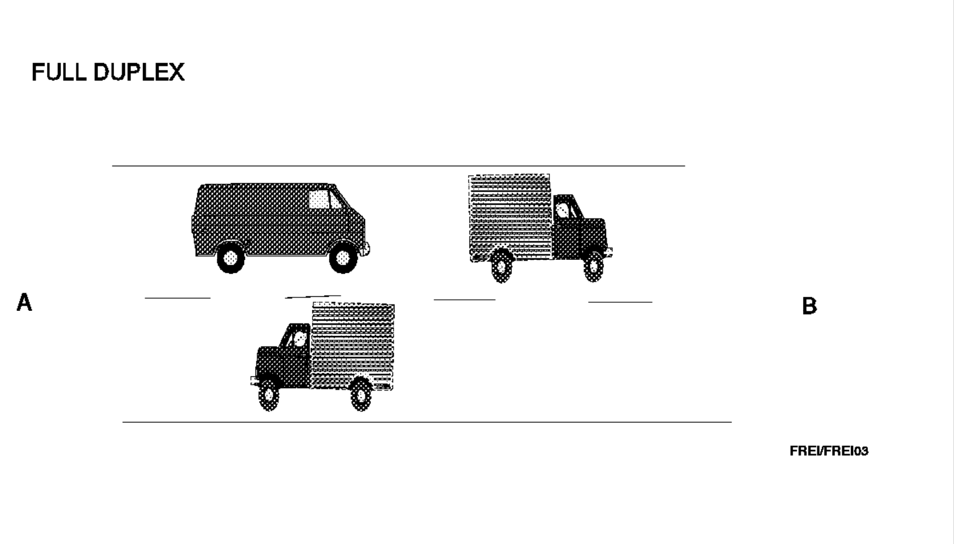


Figure 112. Full-Duplex

10.2 Point-to-Point and Multipoint

When a line connects only two stations, as shown in the following example, it is called a point-to-point line:

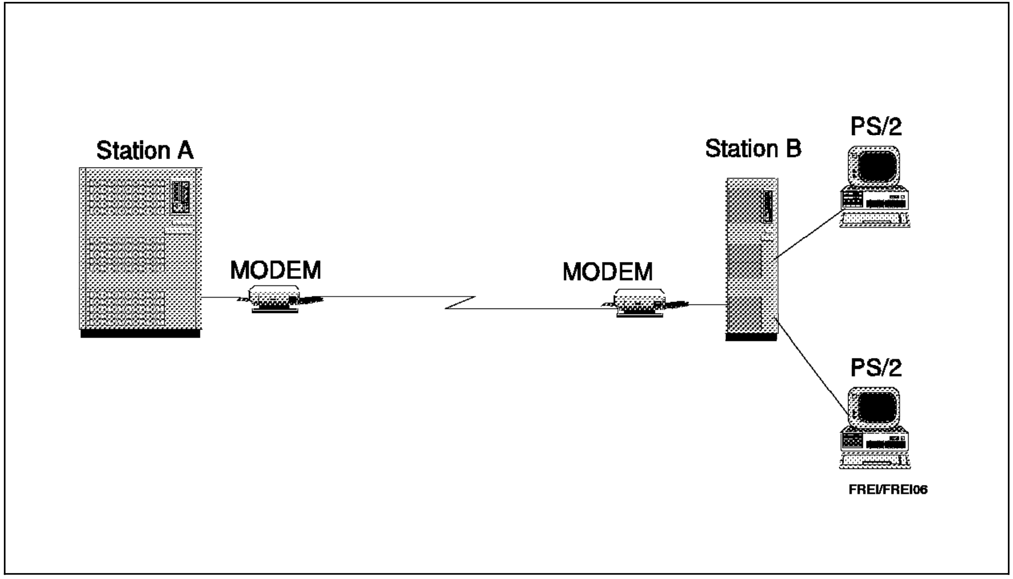


Figure 113. A Point-to-Point Line

When a line connects one station to more than one other station, as shown in the following example, it is called a multipoint or multidrop line:

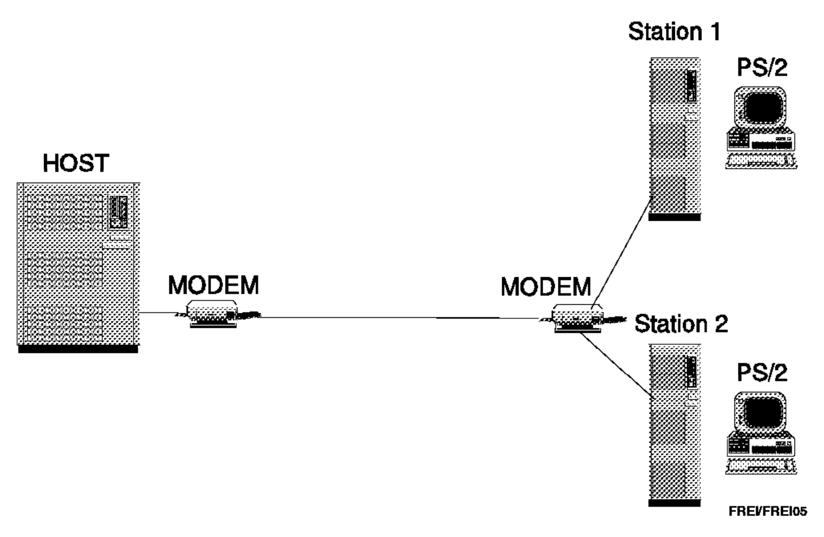


Figure 114. A Multipoint Line

Controlling a point-to-point line is much easier than controlling a multipoint line because it is not necessary to use addressing in a point-to-point line. That is, since all data leaving one station is destined for the station at the other end of the line, there is no possible confusion as to the intended destination of the data. However, on a multipoint line, the data leaving one station is indeed destined for one of the stations on the line and must therefore be identified as such.

However, use of multipoint lines can represent, in many cases, shorter network distances and therefore reduced network costs.

Switched lines are point-to-point lines only (that is, they cannot be multipoint) and leased lines can be either point-to-point or multipoint lines.

10.3 Asynchronous and Synchronous

To establish any type of communication, it is necessary to have some synchronism between the elements involved in the communications process. That is, it is necessary for the components at both ends of a circuit to synchronize their actions.

10.3.1 Asynchronous Communications

In asynchronous communications circuits (also called START/STOP), the modems on each side of the line maintain synchronization with each other by inserting start bits and stop bits with each transmitted character, as illustrated below:

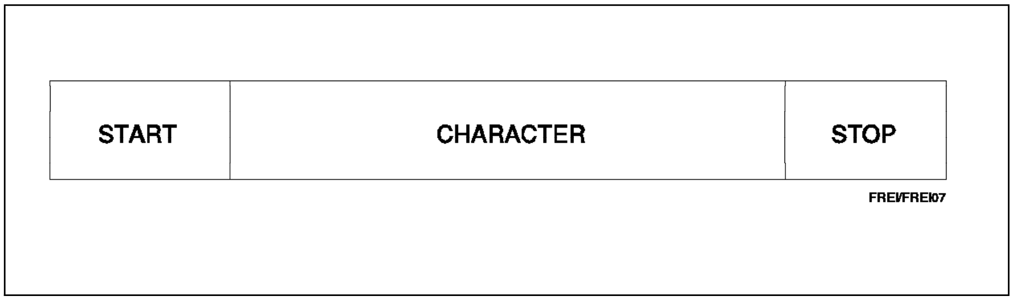


Figure 115. Asynchronous Character

In asynchronous communications, the character length used by your system should match the character length of the remote system, by varying the following parameters:

Start bit +	Data bit +	Parity bit +	Stop bit =	Character Length
1	7	Even	1	10
1	7	None	2	10
1	7	Odd	1	10
1	8	None	1	10

10.3.2 Synchronous Communications

Synchronous communications uses clocking to synchronize the communication and inserts sync bytes at the start and at the end of a block of characters (instead of start bits and stop bits with each character as used in asynchronous communications).

You can define the clock as ″Internal Clocking″ meaning that the clocking will be generated by your own DCE (modem), ″External Clocking″ meaning that the clocking will be provided by the DTE (terminal), or ″Regenerated Clocking″ meaning that the clocking will be provided by the remote DCE (modem).

10.3.3 Comparing Synchronous and Asynchronous Communications

- Synchronous communications use protocols such as HDLC, SDLC, and BSC which all use a CRC (Cyclic Redundancy Check) type of error checking, which is an efficient method of error control.
- Asynchronous communications on the other hand use parity as an error checking method, which is not very efficient. This is why asynchronous communications need modems with better error correction protocols, such as V.42 or MNP 1-4, to be able to adapt better to analog line noise conditions.
- Asynchronous communications have a low transmission efficiency, meaning that they have to transmit a greater number of control bits for every information bit. These control bits are the start bits, stop bits and parity bits, which are all non-information bits considered to be overhead bits.
- Synchronous communications have a much higher transmission efficiency because fewer control bits are required for the same number of information bits. Synchronous communications insert control bits at the end of groups of characters instead of each character.

Characteristics	Synchronous	Asynchronous
Needs Buffers/Clocking	Yes	No
Transmission Efficiency (Information/Control)	High (More than 90%)	Low (Less than 80%)
Equipment	More Expensive	Less Expensive
Error Control	CRC	Parity

10.4 Analog vs Digital

In the figure below, there are two ways to go from A to B.

1. In the first case (analog), it is impossible to know how many steps it will take to get to B.
2. In the second case however, you are either at A or B. In other words there are just two steps, A and B.

This analogy can be used for electrical signals transmitted on a communications line, for example by varying the value of the voltage. On a digital signal, it is possible to count the number of different variations of voltage in an interval of time.

On an analog signal, it is impossible to know how many values the signal has assumed between a high and a low value.

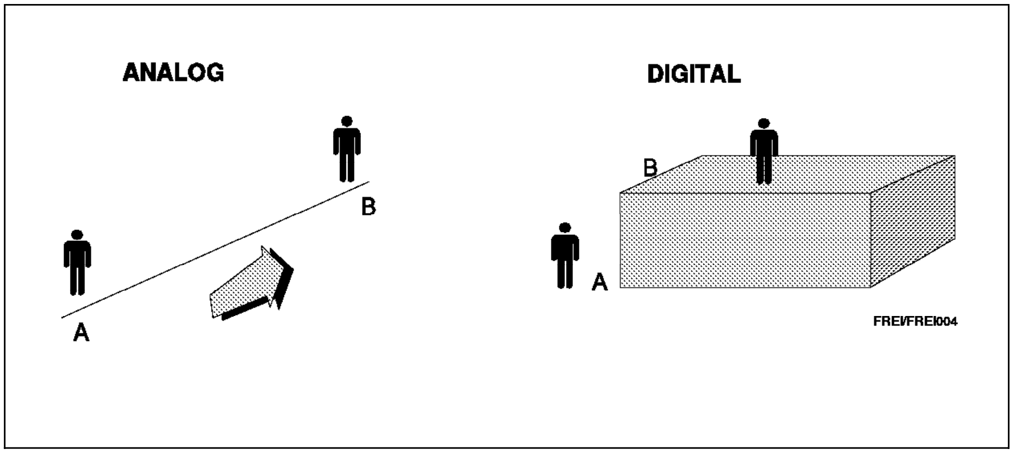


Figure 116. Analog and Digital

10.5 Modulation

In data communications, modulation is the process of using a digital data signal to vary the amplitude, the frequency, or the phase of an analog carrier signal. The modulated carrier signal contains or carries the data transmitted on the communication line. The carrier signal is an analog signal, already adapted to the transmission line in order to minimize the effects of noise and distortion on the digital data signal being carried.

The modulation process and methods are always used between two modems.

10.5.1 Modulation Methods

Following is a brief description of some of the methods used by modems to modulate a carrier signal. All modems on the same communications line must use the same modulation method at the same time.

10.5.1.1 Amplitude Modulation (AM)

Modifies the peak-to-peak amplitude of the carrier signal, as illustrated in the following example:

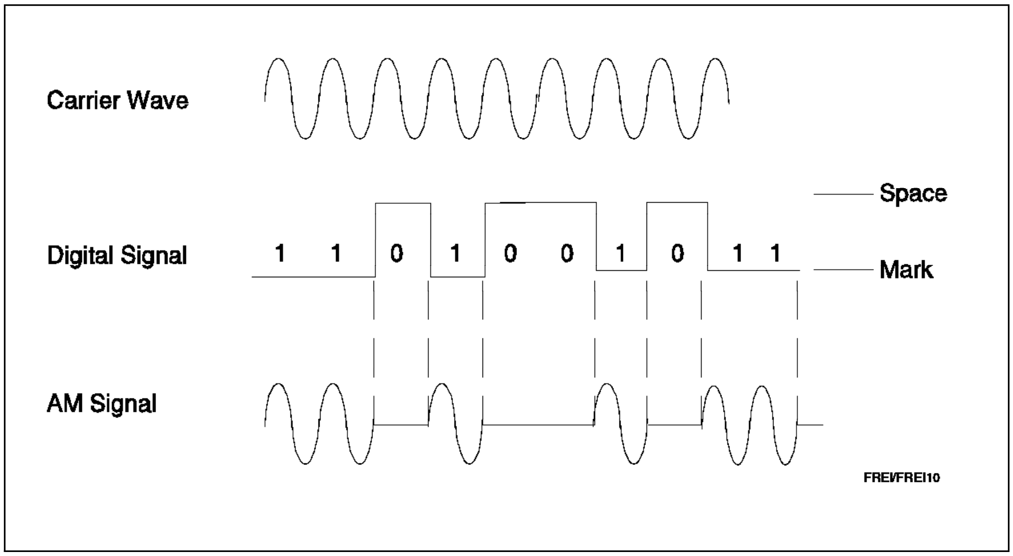


Figure 117. Amplitude Modulation

10.5.1.2 Frequency Modulation (FM)

Also called frequency shift keying (FSK), it modifies the frequency of the carrier to indicate bit-1 or bit-0, as shown in the following example:

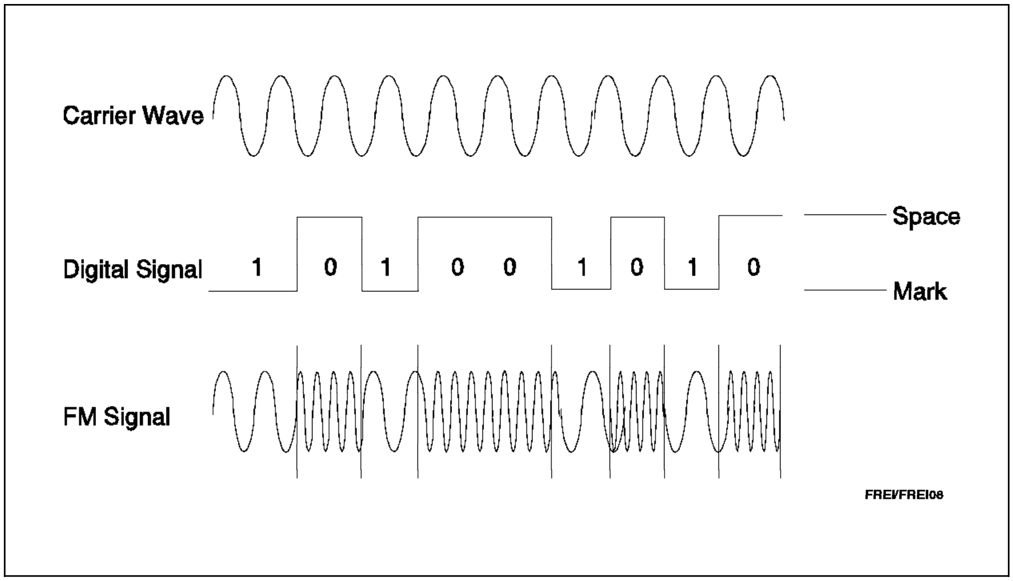


Figure 118. Frequency Modulation

10.5.1.3 Phase Modulation

This method varies the phase of the carrier. Phase modulation is also called phase shift keying (PSK) or differential phase shift keying (DPSK). The following example shows a carrier that is phase modulated:

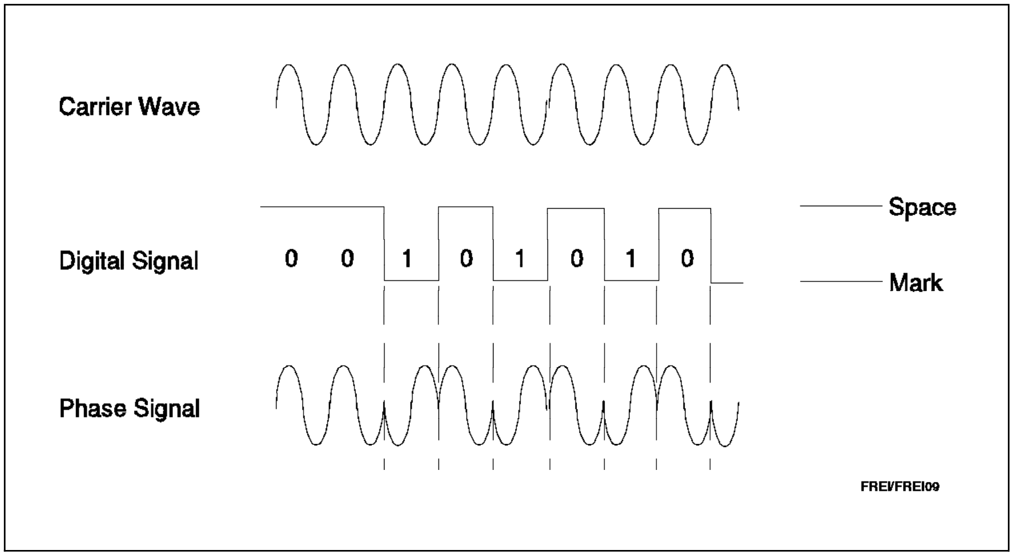


Figure 119. Phase Modulation

10.5.1.4 Example of CCITT Defined Modulation Methods

To increase data transmission speeds and match different modems, the CCITT has defined V.x modulation methods, as shown in the following descriptions:

Note

To connect one modem to another modem, both must use the same modulation method.

- **CCITT V.32bis**

  A modulation method defined to support up to 14.4 Kbps of data transmission on an analog line. Using a data compression method such as V.42bis, a DTE speed of up to 57.6 Kbps can be supported, thereby increasing the throughput by up to 4 times.

  This modulation method varies the amplitude and phase of the carrier at the same time and uses Trellis Code (a method that increases the number of possible variations of amplitude and phase of a carrier) to increase the line speed up to 14.4 Kbps.

  Modems that support this modulation method usually support the following modulation methods as well.

- **CCITT V.32**

  A modulation method defined to support up to 9.6 Kbps of data transmission on an analog line. Using a data compression method such as V.42bis, DTE speeds of up to 38.4 Kbps can be supported, thereby increasing the throughput by up to 4 times.

This modulation method varies amplitude and phase of the carrier at the same time and can use (or not) Trellis Code. If Treillis Code is available, then it is recommended for use by both modems.

- **CCITT V.22bis**

  A modulation method defined to support up to 2.4 Kbps of data transmission on an analog line. Using a data compression method such as V.42bis, DTE speeds of up to 9.6 Kbps can be supported, thereby increasing the throughput by up to 4 times.

  This modulation method varies the amplitude and phase of the carrier at the same time. As with the other methods, it can use full-duplex transmission centering one carrier at 1200 Hz and the other carrier at 2400 Hz, transmitting and receiving at the same time without the necessity of a line turnaround.

- **CCITT V.22**

  A modulation method defined to support up to 1.2 Kbps of data transmission on an analog line. Using a data compression method such as V.42bis, DTE speeds of up to 4.8 Kbps can be supported, thereby increasing the throughput by up to 4 times.

  This modulation method varies the frequency of the carrier as described in the FSK modulation method. Selecting a DTE speed of 1200 bps, you normally would select FSK modulation as the most reliable method described in this chapter. It is recommended to do so when you have bad analog line conditions, that is, when the line is frequently dropping and when other modulation methods are not providing a reliable connection. The response time however will be degraded, but this might be a better condition than no connection at all.

The following figure illustrates a summary of the terms and standards normally used in an analog communications environment. Note that some of these V.xx terms are used to describe either a modulation method, a compression method, an error correction method or an electrical interface.

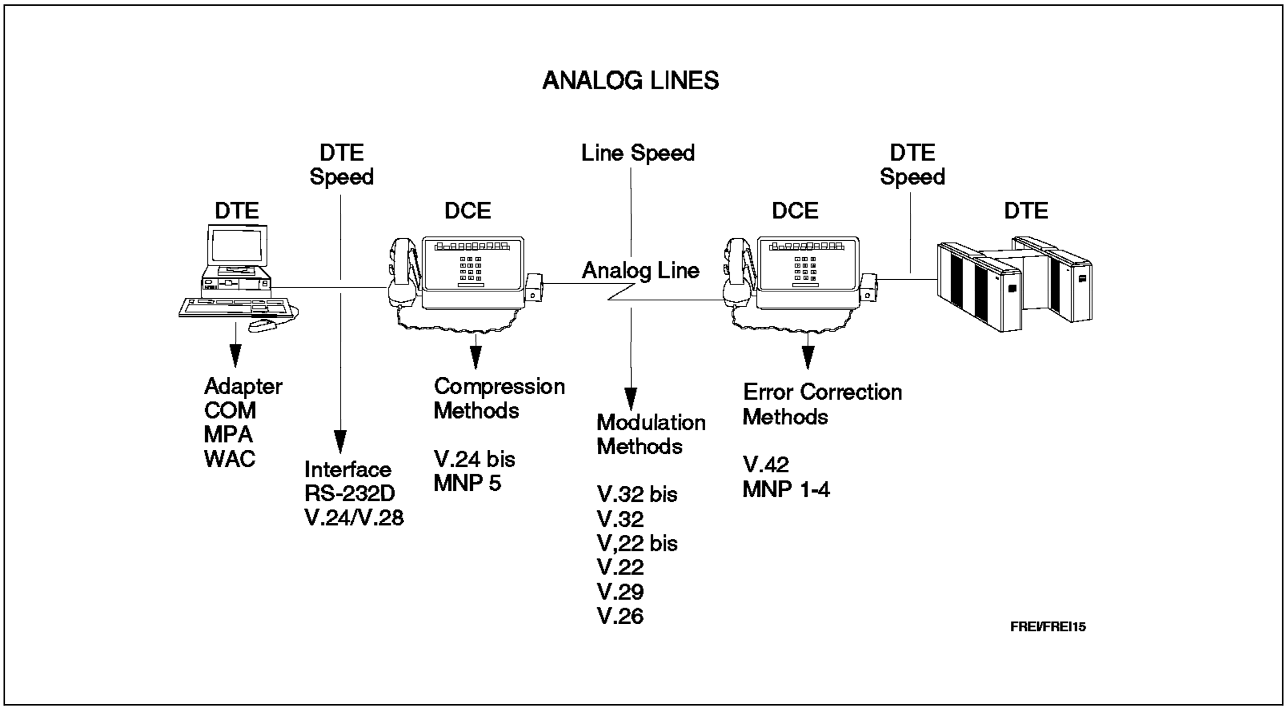


Figure 120. Analog Environment - Summary of Terms and Standards

10.6 Interfaces

The connection between a terminal (Data Data Terminal Equipment or DTE) and a modem (Data Communications Equipment or DCE) is described as a DTE-to-DCE interface. This interface must be compatible; that is, both the DTE and the DCE must use the same interface, with the same specifications, in order for communications to take place. Otherwise, special cables and/or special electronic circuits would be required each time a DTE was connected to a DCE.

Cables, circuits and lines to connect a DTE to a DCE are defined by the EIA or CCITT standards.

EIA Standards are labeled RS-x (Recommended Standards-x) where x is the number of the standard and CCITT standards are labeled V.x or X.x where x is the number of the standard.

For purposes of this discussion, and to simplify matters, you can assume generally that there is a sort of standard equivalency between the CCITT and EIA interfaces.

In the following pages, we give a brief explanation of some of these interfaces supported by CM/2 1.11.

10.6.1 EIA RS-232D or CCITT V.24/V.28

The RS-232D interface is the default serial interface for most types of equipment. It is an interface defined to support low speeds (up to 20 Kbps) and is used for data transmission on analog lines.

Some analog modems, using data compression methods, can support DTE speeds up to 57.6 Kbps. However, modems of this type use up to 14.4 Kbps in the analog line.

Note

The CCITT V.28 standard defines the physical specifications of the interface (such as electrical signals and connectors) whereas the CCITT V.24 standard defines the data signal specifications of the interface. The combination of these two standards (V.28 and V.24) define the same interface as the EIA RS-232D interface (which is a follow on to the RS-232C standard).

The following illustration shows how the DTE is connected to a DCE using connections defined by the RS-232D or CCITT V.24/V.28 interface:

DTE	Line Name / DCE Pin #		MODEM
	Protective Ground	(1)	
	Transmitted Data	(2)	
	Received Data	(3)	
	Request to Send	(4)	
	Clear to Send	(5)	
	Data Set Ready	(6)	
	Signal Ground	(7)	
	Carrier Detect	(8)	
	Select Standby	(11)	
	Transmit Clock	(15)	
	Receive Clock	(17)	
	Test	(18)	
	Data Terminal Ready	(20)	
	Ring Indicator	(22)	
	Speed Select	(23)	
	Transmit Clock	(24)	

Figure 121. RS-232D Connector Pins

The DCE cable connector is called a DB-25 connector. It has 25 pins and appears physically as shown in the following figure:

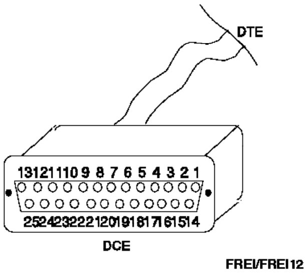


Figure 122. RS-232 DCE Connector

The DTE connector (on the PC side) is not standardized and can vary from machine to machine; however, on the DCE (modem) side, the connector is a DB-25 connector and the sequence of the pins is usually the same as defined by the standard when talking about DCE-to-DTE connections.

If you are planning to connect two machines back-to-back, with a cable, and without using modems, the sequence of the pins should be inverted to match the handshaking process; this type of cable is called a crossover cable.

Note

The RS-232D interface is defined for speeds up to 20 Kbps with a maximum cable length of 15 meters between DTE and DCE. However, if you are using lower speeds or a special cable with low attenuation, you can use cable distances above 15 meters, but it is not recommended.

The RS-232D voltage level specifications are shown below:

Active Control Signal or 0-bit Data

To represent an active control signal, for example a DTR, or 0-bit data, the RS-232D interface defines voltage levels between +3V and +25V for a valid signal.

+3V _____________ +25V
DTR on or 0-bit

Inactive Control Signal or 1-bit Data

To represent an inactive control signal, or 1-bit data, the RS-232D interface defines voltage levels between -3V and -25V for a valid signal.

-3V _____________ -25V
DTR off or 1-bit

In other words, when you initially connect an RS-232D cable between the COM port on your PC and the modem, the pins on the COM port interface will have a negative level of voltage for DTR, RTS, etc.

When you start your communications program, the COM port changes the DTR and the RTS pins to positive voltages and the modem answers by changing its own signals, for example CTS, to positive voltages.

10.6.2 CCITT V.35

The CCITT V.35 interface standard is used to support speeds above 20 Kbps and up to 2.048 Mbps. To do this, the V.35 interface duplicates some of the signal leads (the most important ones) identifying if the signal is active or inactive by the voltage difference between A and B. This is called balanced differential signals and its advantage against non-balanced signals is to permit longer cables with higher speeds.

The important signals described above are the Transmit Data A and B, Receive Data A and B, Transmit Clock A and B and Receive Clock A and B.

The control signals such as DTR, RTS, CTS, etc. operate the same way as in the RS-232D interface standard (non-balanced).

Note

For balanced differential signals, the voltage difference between the signal A and the signal B, for example Transmit Data A and B, should be -0.55V to represent active and +0.55V to represent inactive. The maximum tolerance is plus or minus 20%.

The following diagram illustrates how a DTE is connected to a DCE using connections defined by the CCITT V.35 interface:

DTE	Line Name /	DCE Pin #	DCE
	Protective Ground	(A)	
	Signal Ground	(B)	
	Request to Send	(C)	
	Clear to Send	(D)	
	Data Set Ready	(E)	
	Carrier Detect	(F)	
	Data Terminal Ready	(H)	
	Ring Indicator	(J)	
	Test	(K)	
	Transmit Data-A	(P)	
	Received Data-A	(R)	
	Transmit Data-B	(S)	
	Received Data-B	(T)	
	Transmit Clock-A	(U)	
	Receive Clock-A	(V)	
	Transmit Clock-B	(W)	
	Receive Clock-B	(X)	
	Transmit Clock-A	(Y)	
	Transmit Clock-B	(a)	

Figure 123. V.35 Connector Pins

The DCE cable connector is called an M34 connector. It has 34 pins and its physical appearance is illustrated below:

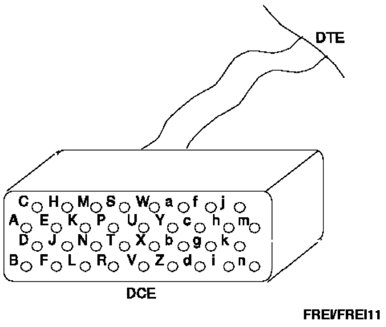


Figure 124. V.35 DCE Connector

10.6.3 RS-422/449 or CCITT V.36(V.11)

The RS-422/449 interface standard is defined to support speeds up to 1.544 Mbps; it uses balanced differential signals to allow longer cables and higher speeds.

Note

The RS-422/449 interface is defined to support speeds up to 1.544 Mbps (T1 channel) and the V.36 interface is defined to support up to 2.048 Mbps (E1 channel).

The following diagram illustrates how a DTE is connected to a DCE using connections defined by the RS-422 interface:

DTE	Line Name / DCE Pin #		DCE
	Protective Ground	(1)	
	DTE Common Return	(37)	
	DCE Common Return	(20)	
	Signal Ground	(19)	
	Request to Send-A	(7)	
	Request to Send-B	(25)	
	Clear to Send-A	(9)	
	Clear to Send-B	(27)	
	Data Set Ready-A	(11)	
	Data Set Ready-B	(29)	
	Carrier Detect	(13)	
	Carrier Detect	(31)	
	Data Terminal Ready-A	(12)	
	Data Terminal Ready-B	(30)	
	Local Loopback	(10)	
	Maintenance Test	(14)	
	Test	(18)	
	Transmit Data-A	(4)	
	Transmit Data-B	(22)	
	Received Data-A	(6)	
	Received Data-B	(24)	
	DTE Clock-A	(17)	
	DTE Clock-B	(35)	
	DCE Clock-A	(5)	
	DCE Clock-B	(23)	
	DCE Rec Clock-A	(8)	
	DCE Rec Clock-B	(26)	

Figure 125. RS-422 Connector Pins

The DCE cable connector is called a DB-37 connector. It has 37 pins, and appears physically as shown in the following figure:

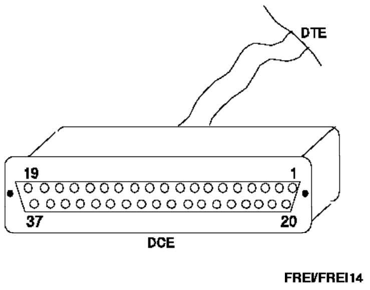


Figure 126. RS-422 DCE Connector

10.6.4 CCITT X.21

The CCITT X.21 interface standard defines the connection of a DTE to synchronous digital public switched data networks.

The following diagram illustrates a DTE connected to a DCE using connections defined by the CCITT X.21 interface:

DTE	Line Name / DCE Pin #		DCE
	Frame Ground	(1)	
	Transmitted Data-A	(2)	
	Transmitted Data-B	(9)	
	Received Data-A	(4)	
	Received Data-B	(11)	
	Indicate-A	(5)	
	Indicate-B	(12)	
	Control Line-A	(4)	
	Control Line-B	(10)	
	Signal Ground	(8)	
	Clocking-A	(6)	
	Clocking-B	(13)	
	Byte timing-A	(7)	
	Byte timing-B	(14)	

Figure 127. X.21 Connector Pins

The DCE cable connector is called a DB-15 connector. It has 15 pins and its physical appearance is shown below:

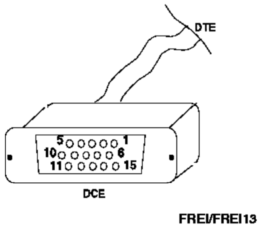


Figure 128. X.21 DCE Connector

The following diagram illustrates the communication process that takes place between a DCE and a DTE when establishing a call in an X.21 environment:

```
DTE                                    DCE

           †I¢ m ready†
                                     control
            0 - bits
CALLING                              transmit
            + characters
  TO                                 receive
          †station select character†
CONNECT                              transmit
           †call progress†
                                     receive
           †call established† 1 bit
                                     receive
           †connection completed†
                                     indicate
           †transmitting data†
ACTIVE                            -  transmit
           †receiving data†
                                     receive
           †disconnecting†
                                     control
DIS-        0 - bits
CONNECT                              transmit
           †disconnecting†
PROCESS                              indicate
            0 - bits
                                     receive
```

Figure 129. X.21 Communications Establishment

10.7 Comparing NRZI Encoding Scheme to NRZ

NRZI (Nonreturn to Zero Inverted)

Data clocking that relies on bit transitions in the data to maintain synchronization might not stay in sync if too many consecutive 0-bits or 1-bits are transmitted.

Because SDLC uses 0-bit insertion and deletion, long series of 1-bits will not occur. However, long series of 0-bits are possible and can be transmitted. As shown below, when a series of 0-bits is transmitted, the Nonreturn to Zero Inverted (NRZI) option ensures that there are enough transitions in the transmitted signal to maintain synchronization.

Transitions are maintained by changing the voltage level of the transmitted data for each 0-bit and maintaining the existing level for each 1-bit.

```
Characters to   |       A       |       1         |
be Transmitted  |_______________|_________________|

Bits to be       1 0 0 0 0 0 1 1 1 0 0 0 1 1 1 1
Transmitted      __           _____       ______
                   |__________|     |_____|

Data using       1 0 0 0 0 0 1 1 1 0 0 0 1 1 1 1      Change on
NRZ scheme       __           _____       ______       Difference
                   |__________|     |_____|
Data using       1 0 0 0 0 0 1 1 1 0 0 0 1 1 1 1
NRZI scheme      __   _   _          _   ________     Change on 0
                   |_| |_| |________| |_|
```

Because 0-bit insertion and deletion ensures that the data can never be all 1-bits, and NRZI ensures that the signal on the line changes level for each zero, the receiving modem or station will receive a sufficient number of transitions to maintain proper synchronization.

In summary, the NRZI option is used to minimize the possibility of losing modem synchronization. It is important to use the same encoding scheme on both sides of the communications line.

10.8 SDLC Zero-Bit Insertion and Deletion

More than five contiguous 1-bits are allowed on the communications line only when an SDLC flag or an abort sequence is transmitted. Otherwise, some data characters could have the same bit configuration as a flag.

To ensure that more than five contiguous 1-bits are not transmitted between flags, the transmitted station inserts a 0-bit after every five contiguous 1-bits. For example, if the transmitting station is transmitting the following bits:

```
First bit                  Last bit
Transmitted                Transmitted
|                                   |
0000110011110001111101111111111111111
```

Zeros are inserted and the actual transmitted data would be:

```
First bit
Transmitted
|
00001100111100011111001111101111101111101
                    |      |     |     |
                     Inserted   Zeros
```

The receiving station deletes the inserted zeros when receiving the data. Zero-bit insertion and deletion is active for the address, control, information and CRC fields of the SDLC protocol. However, the inserted zeros are not included in the CRC computation.

Because zero-bit insertion and deletion is performed for all bits except the flag bits, all 256-character codes can be transmitted as data. This allows a user to transmit data, such as object code programs, without the concern that the data could be interpreted as a flag.

Chapter 11. The AT Command Set

11.1 Modem Attention Command Set (AT Command)

The AT command set is a group of commands that allow the DTE (terminal) to communicate with a DCE (modem) for setting up the modem′s operational environment and controlling the modem′s operation. These commands can be loaded in volatile or non-volatile memory.

The AT command set can be divided into three types:

- AT commands
- S registers
- Result codes

11.2 AT Commands

AT commands are machine instructions, or commands, that are used to activate a modem′s features.

IMPORTANT

Please be aware the examples of AT commands given in this section may not apply to your particular modem. There are hundreds of AT commands, and there are hundreds of types of modems, and they do not all support the same commands in the same fashion.

Therefore, it is possible that some examples of commands given in this section do not apply to your own particular modem. Please refer to your modem documentation to find out which AT command it supports and in which fashion.

Most communications software programs provide menus which can be utilized by the end user to configure and test a modem as required by the communications program.

However, this is not always the case, and some communications software may not support certain modem configuration parameters or may require you to issue commands to the modem directly.

In other words, for you to issue AT commands to any modem, your communications software must provide user access to a command line or have a direct-connect mode, from which you can issue AT commands.

© Copyright IBM Corp. 1995

Note

To use the modem, with or without AT commands, some type of program (communications software or terminal emulation software) is required to configure the modem. AT commands normally cannot be issued from your computer′s operating system prompt. However, you do have limited capabilities by using the command ″COPY CON COM1<enter>″ from an OS/2 window, followed by AT commands, but you will not receive command responses.

There are lots of tools on the market that allow you to send commands to modems. One such tool the PM Terminal application which is supplied with the base OS/2 system; it does not have any special features or functions but it is handy simply because it is supplied with the base system.

An example of using PM Terminal is illustrated later in this chapter.

To enter an AT command, the characters AT (uppercase or lowercase but not aT or At) must prefix the command line on which the AT command is issued.

11.3 S-register

S registers are special memory locations in the modem for storing specific configuration and operating parameters. S registers typically hold some type of counter, timer, ASCII character, or feature negotiation value.

The format of the command to change a register is Sr=n; for example ATSr=n<enter> where r is the S-register to be changed, and n is the value to be assigned to the S-register. Note however that most S-registers can′t be written to.

To read the value currently stored in an S-register, use the command ATSr?<enter> where r is the S-register to be read.

11.4 Result Codes

When you issue an AT command, the modem responds with a result code (usually OK or ERROR) to indicate that it does or does not understand the command. Result codes are also sent to report on the progress of a connection.

The ″V″ command option determines whether result codes are returned by the modem as words or numbers. The modem is normally factory-set to return result codes as words (V1), but can be changed (V0) to return numbers.

A special set of result codes can be enabled to monitor error-control negotiation (the ″W1″ command), if your modem supports it. The W1 option can be very useful for monitoring things such as line speed, DTE speed, data compression used, etc. Refer to examples of AT commands later in this section for a list of the result codes supported.

The memory of the modem is used to store the settings of AT commands and S registers in the following configurations:

Active Configuration

The active configuration stores the configuration settings for the current (active) communications. This storage location is temporary, which means it is valid until you issue a command to change a setting, or reset the modem.

Stored Configurations

Most modems will allow three stored configuration profiles; two of these are user-defined profiles (which can be modified by the user) and the third one is a factory pre-set configuration profile which cannot be changed. Any one of these three stored configuration profiles can be recalled to become the active configuration when you reset the modem or power up the modem.

User Profiles

Different combinations of AT command options and S-register settings can be defined in either of the two user-defined profiles.

After you determine the communications requirements of the remote system that you will contact using a modem, you can specify the AT command options and S-register settings that will customize a configuration to communicate with that system. When you recall a user profile, its settings replace the corresponding settings in the current active configuration.

Some factory settings cannot be saved in memory and recalled as part of a user profile (for example, the command that defines the carriage return character). These settings, which cannot be saved, automatically return to their factory-set value when the modem is reset. However, you can set the non-storable settings in your active configuration by using AT commands from the DTE which can be used in conjunction with a user profile.

The following diagram illustrates some of these concepts.

```
                                                 &V



                                 Active                       User
                                 Configuration                Profiles
Factory
configuration                                       &W0       Profile 0
                                   Storable         &Y0
 Factory              &F          Parameters       Z0
 Parameters
 Values                            You can
                                  change and         &W1      Profile 1
                                    save             &Y1
                                                   Z1

                                  Non-storable
                                  Parameters                  Stored
                                                     &Zn=x    Phone
                                  You can                     Numbers
             Z0,Z1                just change                 n=0,1,2



&V   : displays the active configuration and the parameters stored in
       the user defined profiles.
&F   : recalls the modem¢s factory-set default configuration, replacing
       all current configuration settings.
&W0  : save active configuration as profile 0.
&Y0  : configuration profile 0 active after modem is turned on or reset.
Z0   : reset modem and use configuration profile 0.
&W1  : save active configuration as profile 1.
&Y1  : configuration profile 1 active after modem is turned on or reset.
Z1   : reset modem and use configuration profile 1.
&Zn=x: store telephone number †x† in location †n† (n=0-3)
Z0   : reset modem and use configuration profile 0.
Z1   : reset modem and use configuration profile 1.
```

Figure 130. Modem Configuration Profiles

11.5 AT Commands Quick Reference

For a complete description of the AT commands supported by a particular modem, you should consult the modem documentation. However, in order to give you an appreciation of some of the commands that are available, we will briefly describe some commands below, breaking them down by function type.

Prefix, Repeat and Escape Commands

Command	Description
AT	Each command line begins with AT (and ends with Enter).
A/	Re-execute last command line.
+++	Switch to Command Mode, but keep data connection.
O0	Return to Data Mode from Command Mode.
O1	Return to Data Mode and initiate an equalizer sequence.

Configuration Profile and Reset Commands

Command	Description
&F0	Load the factory default configuration.
&F1	Load MNP 5/V.42bis configuration with XON/XOFF flow control.
&F2	Load MNP 5/V.42bis configuration with RTS/CTS flow control.
&V	View current profile, stored profiles and stored telephone numbers.
&W0	Save active configuration as profile 0.
&W1	Save active configuration as profile 1.
&Y0	Configuration profile 0 active after modem is turned on or reset.
&Y1	Configuration profile 1 active after modem is turned on or reset.
Z0	Reset modem and use configuration profile 0.
Z1	Reset modem and use configuration profile 1.

Answer, Dial, Hang-up and Store Commands

Command	Description
A	Answer incoming call immediately.
Dn	Dial telephone number †n†.
	Dial Modifiers
	, Pause.
	; Return to Command Mode after dialing.
	! Force modem on-hook for 1/2 second (hook flash).
	@ Wait for five seconds of silence.
	P Use Pulse (rotary) dialing.
	T Use Touch-Tone (DTMF) dialing.
	W Wait for second dial tone.
H0	Force modem on-hook (hang-up).
H1	Force modem off-hook (make busy).
&Zn=x	Store telephone number †x† in location †n† (n=0-3).
&P0	Power-on auto-dial disabled.
&P1	Power-on auto-dial enabled.

Register Commands

Command	Description
Sr?	Read and display Register †r† value.
Sr=n	Set register †r† value to †n†.

Modem Operation Commands

Command	Description
E0	Do not echo command characters.
E1	Echo command characters.
&L0	Use dialup operation.
&L1	Use leased-line operation.
&M0	Asynchronous operation.
Y0	Modem neither sends nor responds to break signals.
Y1	Modem sends break signal for 4 seconds before disconnect.

RS-232-C Control Signal Commands

Command	Description
&C0	Force Data Carrier Detect (DCD) signal active (ON).
&C1	DCD indicates true state of remote modem¢s carrier.
&D0	Ignore Data Terminal Ready (DTR) signal.
&D1	Return to asynchronous Command Mode after losing DTR.
&D2	Hang up and go to asynchronous Command Mode after losing DTR.
&D3	Reset after losing DTR.
&R0	Modem turns on Clear To Send (CTS) signal when Request to Send (RTS) signal from attached DTE is detected.
&R1	Modem ignores RTS signal and turns on CTS signal when ready to receive data asynchronously.
&S0	Force Data Set Ready (DSR) signal active (ON).
&S1	DSR off during testing and Command Mode.

Synchronous Mode and Clock Commands

Command	Description
&Q0	Communicate in asynchronous mode.
&Q1	Communicate in synchronous mode 1 - Async-to-Sync.
&Q2	Communicate in synchronous mode 2 - Stored Number Dial.
&Q3	Communicate in synchronous mode 3 - Voice/Data Switch.
&Q4	Communicate in synchronous mode 4 - Hayes AutoSync.
&Q5	Communicate in error-control mode.
&Q6	Communicate in asynchronous mode with automatic speed buffering (ASB) - for interfaces requiring constant speed between the DTE (computer/terminal) and the DCE (modem).
&X0	Modem provides synchronous clock on EIA pin 15.
&X1	Modem accepts DTE synchronous clock on EIA pin 24 and relays it on EIA pin 15.
&X2	Modem derives synchronous clock from remote modem and relays it on EIA pin 15.

Make/Break Ratio Commands

Command	Description
&P0	Make/break dial ratio 39/61 (USA).
&P1	Make/break dial ratio 33/67 (Europe and Hong Kong).

MNP/V.42/V.42bis Commands

Command	Description
%An	Specify auto-reliable fallback character (n=0-127 ASCII).
\A0	64-character maximum MNP block size.
\A1	128-character maximum MNP block size.
\A2	192-character maximum MNP block size.
\A3	256-character maximum MNP block size.
\Bn	Transmit line break to remote modem (n=1<or=n<or=9).
%C0	Disable MNP Class 5/V.42bis data compression.
%C1	Enable MNP Class 5/V.42bis data compression.
\C0	Do not buffer data.
\C1	Buffer data for 4 seconds, until 200 characters are reached or until a packet is detected.
\C2	Do not buffer data for 4 seconds, until 200 characters are reached, or until a packed is detected.
\E0	Do not echo data during normal link.
\E1	Echo data during normal link.
\G0	Disable DCE flow control.
\G1	Enable DCE flow control.
\H0	HP ENQ and ACK protocol disabled.
\H1	Modem emulates ENQ/ACK protocol terminal.
\H2	Modem emulates ENQ/ACK protocol host.
\J0	Disable RS-232-C baud rate adjustment (keep high data between DTE and modem, regardless of modem-to-modem data rate).
\J1	Enable RS-232-C baud rate adjustment so serial data rate automatically adjusts to match the modem-to-modem data rate.
\Kn	Set break control, depends on modem¢s operating condition (0<or=n<or=5). Default is n=5.
\N0	Normal data link only.
\N1	Direct data link only.
\N2	Reliable MNP link only.
\N3	Auto-reliable MNP/Normal link.
\N4	Reliable V.42 link only.
\N5	Reliable .42 or MNP link only.
\N6	Auto-reliable V.42/MNP/Normal link.
\O	Initiate reliable link during normal link.
\Q0	Turn off software flow control.
\Q1	XON/XOFF software flow control.
\Q2	CTS signal unidirectional hardware flow control.
\Q3	RTS/CTS bidirectional hardware flow control.
\Q4	Unidirectional XON/XOFF hardware flow control (modem to host).
\Tn	Inactivity timer (n=0<or=n<or=90 minutes). Default is n=0.
\U	Accept reliable link during normal link.
\V0	Do not send extended MNP/V.42/V.42bis responses.
\V1	Send extended MNP/V.42/V.42bis responses.
\X0	Process XON/XOFF, but don¢t pass through.
\X1	Process XON/XOFF and don¢t pass through.
\Y	Switch to reliable link from normal link.
\Z	End reliable connection (switch to normal operation).
&K0	Disable local flow control
&K1	Enable RTS/CTS local flow control
&K2	Enable XON/XOFF local flow control
&K3	Enable RTS/CTS local flow control
&K4	Enable XON/XOFF local flow control
&K5	Enable Transparent XON/XOFF local flow control

Response Commands

Command	Description
Q0	Send responses to DTE.
Q1	Do not send responses to DTE.
V0	Send numeric responses.
V1	Send word responses.
W0	Do not return negotiation progress messages.
W1	Return negotiation progress messages.
W2	Do not return negotiation progress messages; return CONNECT messages using modem to modem (DCE) speeds instead of modem to terminal (DTE) speeds.
\V0	Do not send MNP/V.42/.42 responses.
\V1	Send MNP/V.42/.42 responses.
X0	Responses 0-4/blind dialing.
X1	Responses 0-5, 8 and 10-13/blind dialing.
X2	Responses 0-5, 8 and 10-13/dial tone detection.
X3	Responses 0-5, 7, 8 and 10-13/blind dialing/busy signal detection.
X4	All responses/dial tone and busy signal detection.

Speaker Volume and Status Command

Command	Description
L1	Low speaker volume.
L2	Medium speaker volume.
L3	High speaker volume.
M0	Speaker is always off.
M1	Speaker on until carrier detected.
M2	Speaker is always on.
M3	Speaker on after dialing until carrier is detected.

Call-Back Security Commands

Command	Description
%S0	Call-back security disabled.
%S1	Call-back security enabled.

Test Commands

Command	Description
&T0	End test in progress.
&T1	Perform Local Analog Loopback Test.
&T3	Perform Local Digital Loopback Test.
&T4	Grant Remote Digital Loopback request by remote modem.
&T5	Deny Remote Digital Loopback request by remote modem.
&T6	Perform Remote Digital Loopback Test.
&T7	Perform Remote Digital Loopback Test with Self-test.
&T8	Perform Local Analog Loopback Test with Self-test.

Bell and CCITT Standards Commands

DTE Baud Rate	Originate Mode	Answer Mode
	B0 Command in Effect	
300	V.21	V.21
1200	V.22	V.22
2400	V.22bis/V.22/Bell 212A	V.22bis/V.22/Bell 212A
9600, 19200, 38400, 57600	V.32bis/V.32/V.22bis/V.22	V.32bis/V.32/V.22bis/V.22
	B1 Command in Effect (Default)	
300	Bell 103	Bell 103
1200	Bell 212A	Bell 212A
2400	V.22bis/V.22/Bell 212A/103	V.22bis/V.22/Bell 212A/103
9600, 19200, 38400, 57600	V.32bis/V.32/V.22bis/V.22 Bell 212A/103	V.32bis/V.32/V.22bis/V.22 Bell 212A/103

Identification Commands

Command	Description
I0	Modem sends product code.
I1	Factory test.
I2	Internal memory test.
I3	MNP/V.42/V.42bis identification.

Guard Tones and Originate/Answer Tones Commands

Command	Description
&G0	No guard tones.
&G1	550 Hz guard tone.
&G2	1800 Hz guard tone.
&K0	Place call using originate tones.
&K1	Place call using answer tones (use to call originate-only modems).

11.6 AT Commands Considerations and Examples

In this section, we provide additional details on some of the more important AT commands that are used to start communications and to do problem determination.

&F Factory Defaults

This command is used to restore the factory default settings.

It is recommended to issue this command any time you start your modem configuration. This can avoid problems related to old setups already present in the modem′s memory. Putting this command at the start of your initialization string automatically resets the modem to the factory settings prior to the setup of your specific configuration, and it can be done in the same step, as illustrated by the following example:

```
AT&F%C1&D2DT123456
```

> **Note**
>
> The highlighted **&F** resets the modem to factory settings. The other commands, %C1,&D2, etc. will be explained in the following pages.

&W Store Active Configuration

This command stores the active configuration in the non-volatile memory of the modem. For example, assume you want to save the following characteristics as configuration profile 0:

```
 Command        Purpose

 X4             Use the X4 responses, and detect dial and busy signal
 &C             Keep carrier detect always on
```

The command issued should be:

```
ATX4&C&W0
```

E Echo Commands

This command is used to return (echo) command responses to your terminal screen when you are sending commands. If the modem is not returning your commands, send the command ATE1 to turn on the echo feature. If you continue without getting a response, check if your modem has a “DUMB” mode feature. Also check the connections and the software port configuration.

D Dialing

The D command instructs your modem to dial (originate a telephone call). You can include the following dialing modifiers:

T	Touch-tone dialing
P	Pulse dialing (used for old public switched telephonic networks)
W	Wait for second dial tone
,	Pause
@	Wait for five seconds of silence
!	Flash
;	Return to command mode after dialing

Here is an example of using the command to dial the telephone number (919) 302-3299, using pulse dialing, and pausing after the area code (919).

```
ATDP919,3023299
```

&D Data Terminal Ready Signal (108)

This is an important command for asynchronous operation. Normally, the modem assumes &D2 to be the default value. The &D2 command instructs the modem to react to the status of the DTR signal (108) from your DTE. In other words, you can get the modem to terminate the connection, initiate new calls and auto-answer calls based on the setting of DTR by the terminal, when appropriate.

M Internal Speaker and L Speaker Level

The M command defines which steps of the connection process you want to listen to. Use the M1 command to start new connections and to monitor what′s happening until the carrier is detected. If you do not want to hear the modem′s speaker, use M0. The L command works with the M command, defining the speaker volume level. For example:

Command	Purpose
ATM0	Turn the speaker off.
ATM1L1	Lower speaker volume (L1) until carrier detected (M1).

A/ Repeat the Last Command Executed

This command is used when you are setting up the modem, sending commands using the keyboard and want to repeat the last command executed. You don′t need to press Enter, because the A/ command works as a retrieve<enter> command.

%C Enable Data Compression

This is an important command to know if your modem supports hardware data compression. If you issue %C1 to a modem that supports data compression, you will receive an OK, and V42.bis or MNP5 data compression will be enabled. If you receive an ERROR, it is likely that the modem does not support hardware data compression.

X Response Sets

Use the X4 command to wait for a dial tone and receive BUSY, CONNECT 9600, NO DIALTONE, etc., responses. However, if you are dialing from a PABX that uses a different dial tone, and the modem is not dialing as expected, then use an X3 command which will cause the modem not to wait for a dial tone before dialing.

Z Reset and Retrieve Stored Configuration Profiles

The Z0 and Z1 commands reset the modem and recall configuration profiles 0 and 1 respectively, which are stored in the non-volatile memory of the modem.

&C Carrier Detect Signal

Use the &C1 command to turn on the carrier detect signal (109) only after the modem detects a carrier signal from the remote modem.

&R Clear to Send Signal (106)

Use &R1 for full-duplex operation and &R0 for half-duplex operation.

&S Data Set Ready Signal

Use the &S1 command to operate according to RS-232 specifications.

&V Display Configuration Profiles

The &V command displays, on your terminal screen, the active and stored configuration parameters, as well as any telephone number stored in the modem memory. It is an important command that allows you to see what′s already configured in the modem profiles, including most register values.

&Q Transmission Modes

The &Q command specifies the asynchronous and synchronous transmission method used, and it also has an option to support error control communications. It is equivalent to the command **&M** , which is supported by some modems.

&Zn=x Store Telephone Number x in Location n

For example, to load the number (192) 65-7140 in position 1 of the memory, issue the command:

```
AT&Z1=192657140
```

To automatically dial this number, use the command DS=n as shown here:

```
ATDS=1
```

Sr? and Sr=n

Use Sr? to read a value stored in register number r as shown in the following example:

```
Command        Response

ATS0?          000
```

The value loaded in register number 0 is 000. This modem is not configured for auto-answer.

Use Sr=n to write a value in register number n.

```
Command        Response

ATS0=002       OK
```

The value of register 0 was changed to 002. Now your modem can auto-answer. Check this information by reading the new value in register 0 with the command ATS0?. If you want to leave your modem in auto-answer, send the command &W to write this information in non-volatile memory as shown in the following example:

Command	Response
ATS0=002&W	OK

The number 002 loaded in register 0 represents the number of rings that the modem will wait before answering the call, in this case 2 rings.

The following command is an example of the initialization string used in an asynchronous switched 5250 emulation scenario using SNA Phone Connections and a GVC FM144V modem:

When the PCM that controls this connection activates, one of its tasks is to initialize the modem. To do so, it will send two initialization strings, which we show here:

Initialization 1 - > ATI

Where: I = Display Product Initialization Code

Initialization 3 - > ATE1L2M1Q0V1X4Y0&C1&D2&M0&R0&S1&T5\\N6%C1S0=0

```
 Where:
   E1 - Echo commands
   L2 - Define medium volume
   M1 - Define speaker on until carrier detect
   Q0 - Define modem send responses
   V1 - Define words responses
   X4 - All responses, dial tone and busy signal detection
   Y0 - Modem does not send or respond to break signals
   &C1- Turn on carrier detect signal when remote carrier signal present
   &D2- Modem hangs up, following an ON-to-OFF DTR transition
   &M0- Define asynchronous operation
   &R0- Modem turns on CTS when detects RTS from the DTE
   &S1- DSR off in test mode and command mode
   &T5- Ignore RDL test request by remote modem
   \N6- V.42/MNP/Normal Data Link
   %C1- Enable MNP5 or V.42bis data compression
   S0=0 - Disable autoanswer
```

If the initialization strings are successful, the next step would be to send a dialing command (ATDT#) when you start the emulator.

Note

Some AT commands are not listed in the AT Command Quick Reference, because they represent the same thing as other commands, which have already been covered.

In this case &M0 represents the same thing as &Q0, which is listed in the AT Command Quick Reference.

Initialization string 3 was used in this example because CM/2 was only configured for outgoing calls. To configure CM/2 for incoming calls, **Initialization string 2** is used and register 0 of the modem will take on a value of 002, because of the command S0=2 instead of S0=0.

Easy Asynchronous Operation

To enable...	Type these commands...
V.42bis operation	AT\N6\Q3\J\V1%C1 <enter> or AT&F2 <enter>
MNP5 operation	AT\N3\Q3\J\V1%C1 <enter>
Normal operation	Use the factory default settings. If you¢ve modified any settings, type AT&F <enter> to return to factory default settings.
Auto-answer	ATS0=1 <enter>
Power-on auto-dial	AT%P1S0=0&Z0=n <enter> (where †n† is the telephone number to be auto-dialed when the modem is powered-on).
Power-on leased-line auto-connect	Originating modem - AT%P1&L1S0=0 <enter> Answering modem - AT%P1&L1S0=1 <enter>

Easy Synchronous Operation

To enable...	Type these commands...
Auto-answer	AT&Q2S0=1 <enter>
Power-on auto-dial	AT&Q2%P1S0=0&Z0=n <enter> (where †n† is the telephone number to be auto-dialed when the modem is powered-on).
Power-on leased-line auto-connect	Configure modem for dumb mode after sending the following commands: Originating modem - AT&M2&L1S0=0 <enter> Answering modem - AT&M2&L1S0=1 <enter>
Manual dialing	AT&Q3 <enter>

S-register Descriptions

Register	Description	Range/Units	Factory Setting
S0	Select ring to answer on	0-255 rings	0
S1	Ring count (incremented with each ring)	0-255 rings	0
S2	Escape sequence character	0-127 ASCII	43
S3	Carriage return character	0-127 ASCII	13
S4	Line feed character	0-127 ASCII	10
S5	Back space character	0-32, 127 ASCII	8
S6	Wait before blind dialing	2-255 sec	2
S7	Wait time for carrier/silence	1-255 sec	50
S8	Duration of delay for comma	0-255 sec	2
S9	Carrier detect response time	1-255 1/10 sec	6
S10	Delay carrier loss to hang up	1-255 1/10 sec	14
S11	Duration/spacing of tones	50-255 msec	95
S12	Escape sequence guard time	0-255 1/50 sec	50
S18	Select test timer	0-255 sec	0
S25	DTR change detect time	0-255 1/100 sec	5
S26	RTS/CTS delay	0-255 1/100 sec	1
S30	Automatic timeout (S30 monitors the activity on the line; the factory-set default is 0, which disables the timer)	0-255 10 sec	0
S36	Negotiation fallback	0,1,3,4,5,7	7
S37	Maximum DCE line speed	0,1,2,3,5,6,7,9	0
S38	Delay before forced hangup	0-255 seconds	20
S43	Current DCE speed	0-12	n/a
S46	Error-control protocol selection	2, 136, 138	2
S48	Feature negotiation action	0,3,7,128	7
S49	Buffer lower limit	1-249 bytes	8
S50	Buffer upper limit	2-250 bytes	l6
S63	Private Circuit Carrier Level	-9 dBm	-9
S69	Link layer window size	1-15 frames	15
S70	Maximum number of retransmissions	0-255 retries	10
S71	Link layer timeout	1-255 1/10 sec	2
S72	Loss of flag idle timeout	1-255 seconds	30
S73	No activity timeout	1-255 seconds	5
S82	Break signaling technique	3,7,128 values	128
S84	Adaptive Startup (ASU) Negotiation	0, 128, 129 130, 131, 132	129
S85	ASU Negotiation Report	0, 128, 129 130, 131, 132	0
S86	Connection failure cause code	0,4,5,6,7,8,9, 10,11,12,13, 14,15	n/a
S87	Fixed Speed DTE Interface	14, 28	14
S91	PSTN Transmit Level Adjustment	0 to -15 dBm	0
S92	MI/MIC Operation	0,1,3,5,7,9,11, 13,15	0
S93	CCITT V.25bis DTE Interface Speed:	3,5,6,7,8,9,10, 11,13,15	n/a
S94	Command Mode Selector:	0-15	0
S95	Negotiation Message Options:	1,2,4,8,16,32	0
S97	V.32 automode V.22/V.22bis probe timing	15 to 70 (1.5 to 7.0 seconds)	30
S108	Signal Quality Selector	0-3 values	2
S109	V.32bis Carrier Speed Selector	0-3 values	1
S110	V.32/V.32bis Selector	0-2 values	2

11.7 Data Compression

Data compression can significantly improve the throughput of your connections by reducing the time required to transmit and receive data.

When hardware data compression is enabled with an AT command, %C1 for example, the modem compresses the data received from the DTE before sending it to the analog line, and decompresses the data received from the other modem before sending it to the DTE.

However it is important to know that some modems don′t implement hardware data compression and come with software to do it. If you are looking for the best performance and compatibility try to avoid using modems that implement data compression techniques by software.

To know if the modem supports data compression by hardware, send the command AT%C1 or an equivalent that enables any data compression method and wait for a response of OK.

11.7.1 Compression Techniques

The following data compression methods are usually used by modems:

CCITT V.42bis

This method provides compression capabilities of 4:1. In other words, you can have a DTE speed four times greater than the line speed.

For example you can define 57600 bps in your software configuration and your modem will run at 14400 bps over the analog line, obviously if they support both speeds.

MNP Class 5

This method provides compression capabilities of 2:1.

For example, you can define 4800 bps in your software configuration and your modem will run at 2400 bps over the analog line, after enabling MNP/5.

Note

If you are using data compression to transmit a file already compacted in the ARC or ZIP format, for example, you may actually be increasing the time it takes to transfer instead of reducing it. In that case you should turn off data compression.

11.8 PM Terminal

PM Terminal is a communications program that comes with OS/2 and you can use it to configure your modem using AT commands.

Note

PM terminal no longer ships with OS/2 Warp, but it does ship with CM/2 as the Softerm Custom Plus Emulator. Many other tools using similar function also exist.

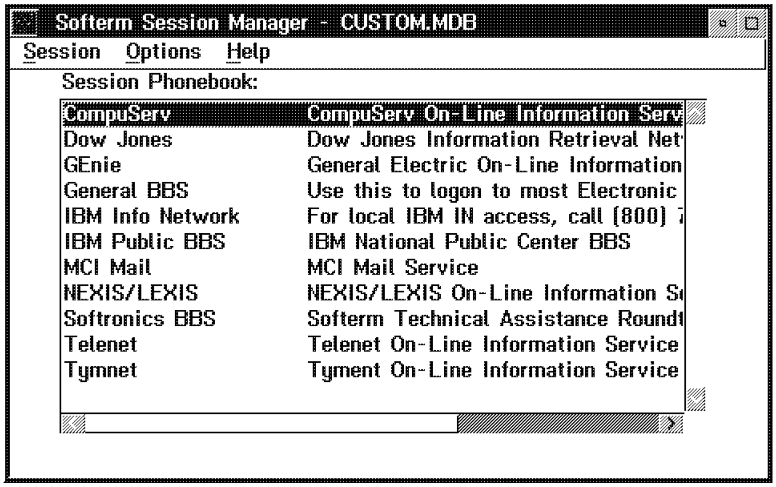
To start PM Terminal follow these steps:

- Open the OS/2 System folder.
- Select the Productivity folder.
- Select the PM Terminal icon (double-click with mouse button 1).

Note

If you don′t have a PM Terminal icon in the Productivity folder, you need to do a selective installation from the OS/2 System Setup folder, and select the Selective Install icon. Make sure you have your OS/2 Base System diskettes ready.

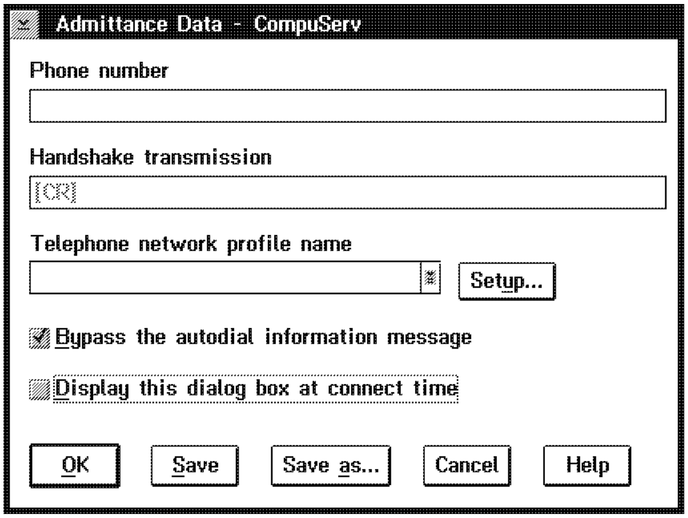
PM Terminal will show you the following screen:



CompuServ	CompuServ On-Line Information Serv
Dow Jones	Dow Jones Information Retrieval Net
GEnie	General Electric On-Line Information
General BBS	Use this to logon to most Electronic
IBM Info Network	For local IBM IN access, call (800) 7
IBM Public BBS	IBM National Public Center BBS
MCI Mail	MCI Mail Service
NEXIS/LEXIS	NEXIS/LEXIS On-Line Information S
Softronics BBS	Softerm Technical Assistance Roundt
Telenet	Telenet On-Line Information Service
Tymnet	Tyment On-Line Information Service

Figure 131. Session Phonebook

Select CompuServ as shown in the figure to get to the following window:



Phone number

Handshake transmission
[CR]

Telephone network profile name

☑ Bypass the autodial information message

☐ Display this dialog box at connect time

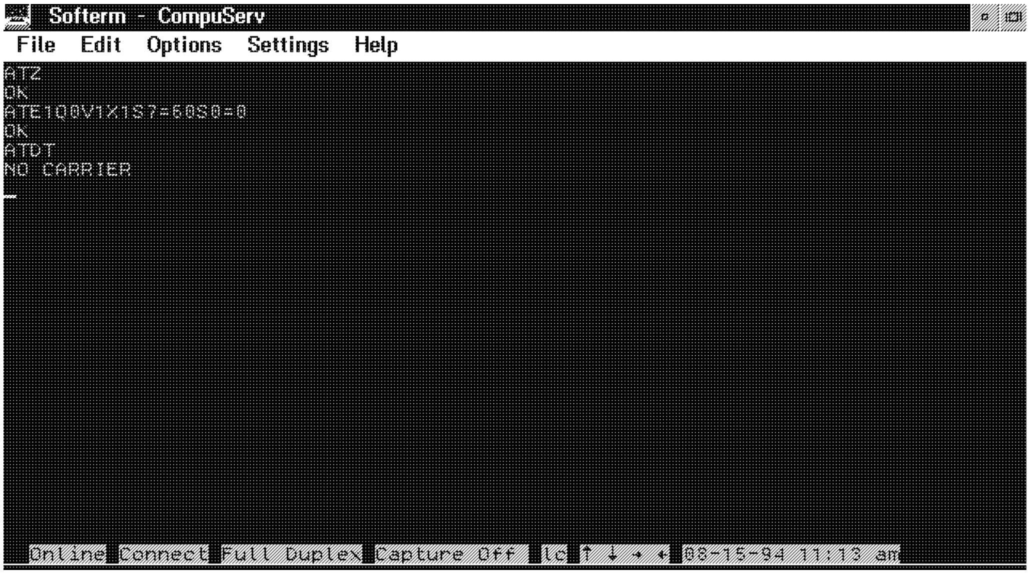
Figure 132. Admittance Data

Select **Bypass the autodial information message**.

Deselect **Display this dialog box at connect time**.

Select **OK**.

The following window will be displayed after you press Enter:

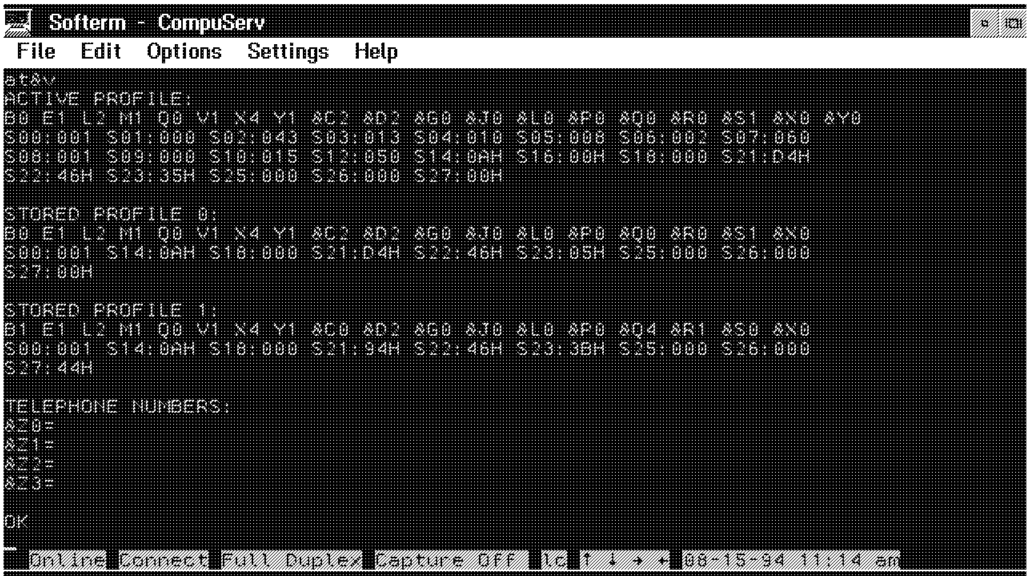


```
ATZ
OK
ATE1Q0V1X1S7=60S0=0
OK
ATDT
NO CARRIER
```

```
Online Connect Full Duplex Capture Off lc ↑ ↓ → ← 08-15-94 11:13 am
```

Figure 133. AT Command Screen

Type an AT command, AT&V for example, to start sending commands to your modem, as shown in the following example:



```
at&v
ACTIVE PROFILE:
B0 E1 L2 M1 Q0 V1 X4 Y1 &C2 &D2 &G0 &J0 &L0 &P0 &Q0 &R0 &S1 &X0 &Y0
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060
S08:001 S09:000 S10:015 S12:050 S14:0AH S16:00H S18:000 S21:D4H
S22:46H S23:35H S25:000 S26:000 S27:00H

STORED PROFILE 0:
B0 E1 L2 M1 Q0 V1 X4 Y1 &C2 &D2 &G0 &J0 &L0 &P0 &Q0 &R0 &S1 &X0
S00:001 S14:0AH S18:000 S21:D4H S22:46H S23:05H S25:000 S26:000
S27:00H

STORED PROFILE 1:
B1 E1 L2 M1 Q0 V1 X4 Y1 &C0 &D2 &G0 &J0 &L0 &P0 &Q4 &R1 &S0 &X0
S00:001 S14:0AH S18:000 S21:94H S22:46H S23:3BH S25:000 S26:000
S27:44H

TELEPHONE NUMBERS:
&Z0=
&Z1=
&Z2=
&Z3=

OK
_
```

Online Connect Full Duplex Capture Off lc ↑ ↓ → ← 08-15-94 11:14 am

Figure 134. AT Command Example

11.9 Modem Leads

Most external modems and some internal modems have leads to indicate the sequence of communications, which describes how a DTE (Data Terminal Equipment) starts a communications process with a modem (Data Communications Equipment).

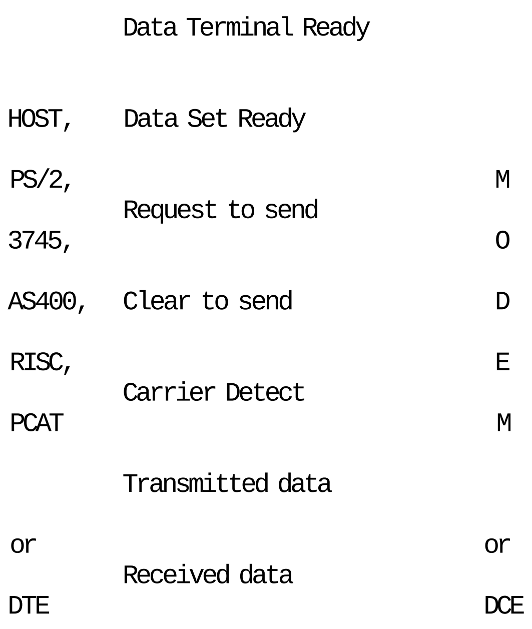


Figure 135. DTE and DCE Communications

The modem leads are an important way of understanding where you are in the communication process (refer to above figure).

There are some important leads that you should know about, because they can help you to start communications between two computers, and with problem determination as well.

The figure shown below is an example of the modem lead sequence for switched full-duplex communication using AT commands to dial:

```
 DTR                                      MODEM
          I¢m alive !
                                         DTR/108

HOST,     I believe.
                                         DSR/107
PS/2,
          I want to transmit !
3745,                                 -  RTS/105

AS400,    I¢m ready for send.
                                         CTS/106
RISC,
          AT command to dial.
PCAT                                     TD/103

         Command OK, I¢m dialing.
                                         RD/104

or        The line is OK now !
                                         CD/109
DTE
          I¢m sending my message.
                                         TD/103

          Your message arrives OK.
                                         RD/104
```

Figure 136. Switched Full-Duplex Communication

The next figure shows an example of the modem lead sequence for leased full-duplex communication.

```
 DTR                                     MODEM
        The line is always OK !
                                        CD/109

HOST,   I¢m waking up ...
                                    -    DTR/108
PS/2,
        I was waiting for you !
3745,                                    DSR/107

AS400,  I want to transmit !
                                         RTS/105
RISC,
        I¢m ready for send !
PCAT                                     CTS/106

        I¢m sending my message.
 or                                     TD/103

 DTE    Your message arrives OK.
                                        RD/104
```

Figure 137. Leased Full-Duplex Communication

11.10 Modem Leads Descriptions

108/DTR - Data Terminal Ready

This is the lead that shows you if the communications program started the port. It could be CM/2 activating COM1 at the workstation side, a 3745 line, or an AS400 controller line to the modem at the host side.

After connecting the appropriate cable and starting *any* communications program, the 108/DTR lead must be ON. The same thing will happen at the host side, after starting the line from a 3745 or an AS/400 controller.

In the modem AT command configuration, let the DTE control the DTR signal by using the command AT&D2.

If the 108/DTR lead is always off, check the communications program, the port or the cable. You probably don′t have a modem problem.

107/DSR - Data Set Ready

This is the modem response to the communications program, after receiving the 108/DTR signal. It could be forced on or not in the modem setup.

105/RTS - Request to Send

This is a DTE signal that requests the modem to send data. It is the signal that determines the line turnaround time in half-duplex communications. In full-duplex communications this signal should remain on during data transmission.

106/CTS - Clear to Send

This is a modem signal that will be turned on when the modem detects a request to send signal (RTS) from the attached computer.

Leave this signal dependent on the RTS signal in your modem configuration. You could have problems if you try to force this signal on.

109/CD - Carrier Detect

This is a remote modem signal that will be turned on when the line between modems is OK.

Normally in a leased line this signal is always on. In switched lines, you will wait for this signal after dialing and connecting to the remote modem.

If the 109/CD lead turns on for a few moments and then turns off, the modem configuration could be wrong. Review parameters such as speed, parity, method of compression and finally the level of transmission. Try to use lower speeds to identify possible line problems.

103/TD - Transmission Data

This is a DTE signal that will be turned on when the DTE is sending dialing commands that are being echoed and when the DTE is sending data after the carrier detect signal comes on.

104/RD - Receive Data

This is a modem signal that will be turned on when the DTE is sending dialing commands that are being echoed.

It is a remote DTE signal that will be turned on when the remote DTE is sending data to the local DTE.

Note

Synchronous, AutoSync and SNA over asynchronous communications always leave the 103/TD and the 104/RD signals blinking, because even though there is no data to transmit or receive, the protocol continues sending and receiving RR (Receiver Ready) frames.

When you are using traditional asynchronous communications, the leads 103(TD) and 104(RD) flash only when you are receiving or transmitting data. These leads will remain off if you are not transmitting or receiving data.

11.11 CCITT V.25 bis

V25.bis is a CCITT communications standard that defines whether the autodial function is synchronous or asynchronous.

If your DTE equipment only supports synchronous communications to initiate calls then V.25bis should be used. In most cases, however, asynchronous configurations are supported by DTEs, and controlling the modem through AT commands is more appropriate.

Note

Don't confuse a synchronous command to initialize a call with synchronous operation. Synchronous operation can be initialized using an AT command, but an AT command can only be issued in asynchronous mode.

V.25bis Commands Quick Reference

Command	Description
CIC	Connect Incoming Call
CNL	Local Configuration
CNR	Remote Configuration
CRI	Call Request with ID
CRN	Call Request with Number
CRS	Call Request using Stored Number
DIC	Disregard Incoming Call
PRN	Program Number
RLD	Request List of Delayed Numbers
RLF	Request List of Forbidden Numbers
RLN	Request List of Numbers

Chapter 12. Communications Manager/2 SNA Phone Connect Environment

When CM/2 Version 1.0 became available, it provided support for ISDN digital circuits over which a user could use autodial functions to establish a connection with any other user on the same ISDN network.

CM/2 Version 1.11 extends this autodial facility to analog circuits, for both synchronous and asynchronous circuits. The ISDN functions that were previously available are now part of the SNA Phone Connect environment, and ISDN facilities are just another option available to the SNA Phone Connect feature to establish connections to other workstations.

For more information on the ISDN support, please refer to *Communication Manager/2 Version 1.1 Enhancements, GG24-4142* and to the product documentation.

This chapter describes how Port Connection Managers, Connection Manager, and other CM/2 components and interfaces are used in order to establish connections to other systems. It will look at their roles and relationships, and also illustrate some of the more important data flows between these components and across some of the interfaces. The objective of this chapter is to enhance the understanding of the user to enable him to do better problem determination.

This chapter consists of the following four sections:

- SNA Phone Connect - Major Components and Interfaces
- Main Events at OS/2 Boot Time
- Main Events at CM/2 Start time
- Outgoing Call and Incoming Call Flow Examples

12.1 SNA Phone Connect - Major Components and Interfaces

The SNA Phone Connect environment, as illustrated in Figure 138 on page 177, consists of major components such as:

- One or more Port Connection Managers (PCMs),
- A Connection Manager (CXM),
- A Connection Network Management (CNM) Manager,
- And one or more MACs

communicating across a set of interfaces such as:

- A Connection Manager Interface (CMI)
- A Generalized Call Control Interface (GCCI)
- A Switched Connection Path Interface (SCPI)
- And Network Driver Interface Specifications (NDIS)

to provide the services required to establish connections to other workstations.

- **ISDN, V-Series Port Connection Manager (PCM, VPCM)**

© Copyright IBM Corp. 1995

A PCM manages the port through which a workstation is physically connected to the network. Its primary responsibility is to interface with the network by placing outgoing calls, following requests to do so from the Connection Manager. The PCM also reports the arrival of all incoming calls to the Connection Manager.

The PCM and Connection Manager communicate via the *Generalized Call Control Interface (GCCI)*. Because of its role as a facilitator between these potentially diverse components, the GCCI should remain constant across all types of switched networks.

In the case of ISDN, each PCM, for example, has its own variations to the CCITT ISDN standards for layers 1, 2, and 3 on the D-channel. The PCMs are expected to recognize these differences and manage them transparently to the Communications Manager environment.

A VPCM is responsible for establishing, maintaining, and terminating connections across the analog telephone network. A VPCM also communicates with the MAC through the Switched Connection Path Interface (SCPI), which will be discussed later.

- **Connection Manager (CXM)**

  The Connection Manager manages all PCMs in the system and is responsible for making outgoing calls on behalf of the communications subsystems and applications that need to communicate over switched and leased connections. It also is responsible for routing incoming calls received from the network by a PCM to an appropriate subsystem or application.

  The *Connection Manager Interface (CMI)* is an API to the Connection Manager that allows an application to communicate with the Connection Management in order to control the placement and receipt of calls.

  Note

  Connection Manager retrieves outgoing/incoming directory entries from the SNAPHONE.CXM file. Note that the name SNAPHONE.CXM is now a fixed and pre-determined name which cannot be changed by the user. It was possible, in previous CM/2 versions, to give a user assigned name to this file, and even to have multiple CXM files. When you install CM/2 Version 1.11, if there were entries that existed in user-defined CXM files present in CMLIB, these entries will be automatically merged into SNAPHONE.CXM during the upgrade from the previous release.

- **Communication Network Management (CNM) Manager**

  The CNM Manager provides RAS (reliability, availability, serviceability) support (for example CM/2 trace and dump services) to other components such as the Module Enabler, Connection Manager, and Port Connection Managers. CNM Manager is initialized by the Module Enabler component at CM startup.

  The Module enabler is the component responsible for starting all the SNA Phone Connect related components.

- **ANDIS MACs**

  The MACs are the device drivers that control the physical adapters and they isolate the upstream components from the specifics of the adapter hardware. They communicate upstream with either the virtual MACs (VMACs) via the ANDIS interface or with the PCMs through the SCPI interface. These MACs have different framing mechanisms for data communication and handle modems differently.

There are three MACs supplied with CM/2, and automatically configured by CM/2 through the PCM configuration process; they are:

COMMAC.SYS Asynchronous end-to-end via COM port (COM Port MAC)

MPADD.SYS Synchronous end-to-end via MPA card (MPA MAC)

HAMMAC.SYS Synchronous end-to-end via COM port (AutoSync MAC)

There are also OEM MACs that can be written to interface to CM/2′s SNA Phone Connect environment. These OEM MACs are not supplied with CM/2 but are supplied with the adapter, such as the WAC adapter for example, which would supply the IBMWAC.OS2 MAC driver for Synchronous end-to-end via WAC card (WAC MAC).

Other components and interfaces appearing on the diagram are:

- **Network Driver Interface Specification (NDIS)**

  The protocol stacks for switched networks over SNA Phone Connect, which are provided by Communications Manager, support the NDIS interface. The Microsoft** and 3Com** corporations jointly developed the Network Driver Interface Specification (NDIS) as a medium access control (MAC) interface for local area network (LAN) adapter drivers (hereafter referred to as network adapter drivers or MAC drivers) and protocol drivers.

  A network adapter driver provides the communication between a network adapter and a protocol, using NDIS as the interface. Network adapter drivers handle the basic transmission and reception of packets on the network. LAN Adapter and Protocol Support (LAPS), which is a part of NTS/2, supports IBM and original equipment manufacturer (OEM) network adapter drivers that comply with NDIS, up to NDIS Version 2.01. LAPS supplies network adapter drivers and also supports the installation and configuration of IBM and OEM network adapter drivers.

- **Advanced NDIS (ANDIS) and Switched Connection Path Interface (SCPI)**

  ANDIS is an extension based on NDIS 2.01. Its architectural extensions are driven by the requirements to support Wide Area Networks (WANs), HDLC oriented protocol drivers, the new PCMCIA standard adapters, wireless connectivities, and isochronous LANs (ISO LANs) in addition to the current NDIS LAN environment. Of course, since the ANDIS architecture is a compatible superset of the existing NDIS architecture, MACs, protocol drivers (PDs), and protocol manager (ProtMan) which are the basic NDIS components can be combined with Connection Manager, PCM, Virtual MACs (VMACs), and ANDIS MACs.

  The SCPI is the lower interface of the V-Series PCM. SCPI is the VPCM′s implementation of the ANDIS Real-time Connection Control Interface (ARCCI). This interface is used when a phone connection is established or terminated.

- **Protocol Driver (PD)**

  The protocol drivers for SDLC, IDLC, X.25, and LAN protocols were made available in the previous version of CM/2. These drivers enable communication in WAN environments using NDIS.

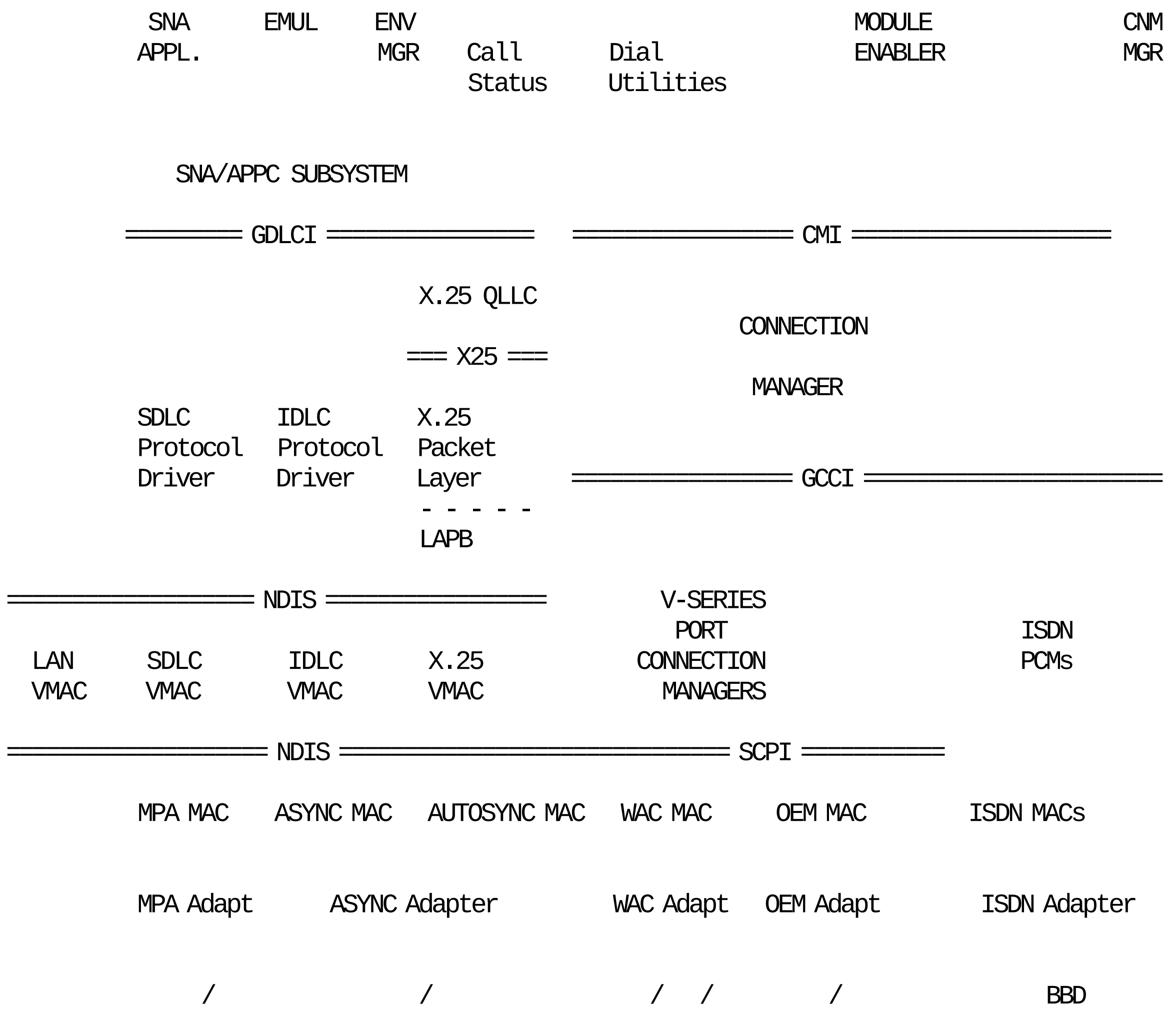
- **Virtual MACs (VMAC)**

Virtual MACs were made available in CM/2 Version 1.0. These VMACs are required to communicate through switched WAN environments; however, LANVMACs can only be used by ISDN communication.

- **Dial Utilities (CMCALL and CMANSWER)**

  These dial utilities are not components but applications, written to the CMI interface, which allow users to initiate and terminate calls manually.

  These utilities were initially provided for ISDN communication using SDLC for sidestream dialing and LAN protocols (NetBIOS, IEEE 802.2, and TCP/IP); they are therefore installed by the CM/2 CMSETUP process only when ISDN is also configured on the workstation. They can however be used also for other SNA Phone Connect functions such as Async, Sync and Autosync, in addition to ISDN.



GDLCI - Generalized Data Link Control Interface
GCCI - Generalized Call Control Interface
CMI - Connection Manager Interface
SCPI - Switched Connection Path Interface
NDIS - Network Driver Interface Specifications
ANDIS - Advanced Network Driver Interface Specifications
MAC - Media Access Control

Figure 138. SNA Phone Connect - Major Components and Interfaces

12.2 Main Events at OS/2 Boot Time

When the system is started, the many modules and drivers specified in CONFIG.SYS commands are initialized. The MACs and protocol drivers related to CM/2′s communication needs are also initialized based on statements present in the PROTOCOL.INI file, so it is important to understand the many drivers provided by CM/2 for the SNA Phone Connect function.

As described before, SNA Phone Connect supports the NDIS environment. Since NDIS was originally supported by LAPS (LAN Adapter and Protocol Support), LAPS will be discussed first.

12.2.1 LAPS Overview

If the user′s system has been installed with LAPS, the LAPS components configured in PROTOCOL.INI are loaded and initialized when OS/2 is started.

PROTOCOL.INI contains NDIS configuration information for a workstation. LAPS creates and updates a PROTOCOL.INI file based on the configuration selections made using the LAPS window interface. Similarly, CMSETUP also updates the PROTOCOL.INI file if a protocol driver for SNA Phone Connect is configured. Figure 139 shows the relationship of LAPS to applications that require a LAN connection only. LAPS can configure protocol drivers and network adapter drivers.

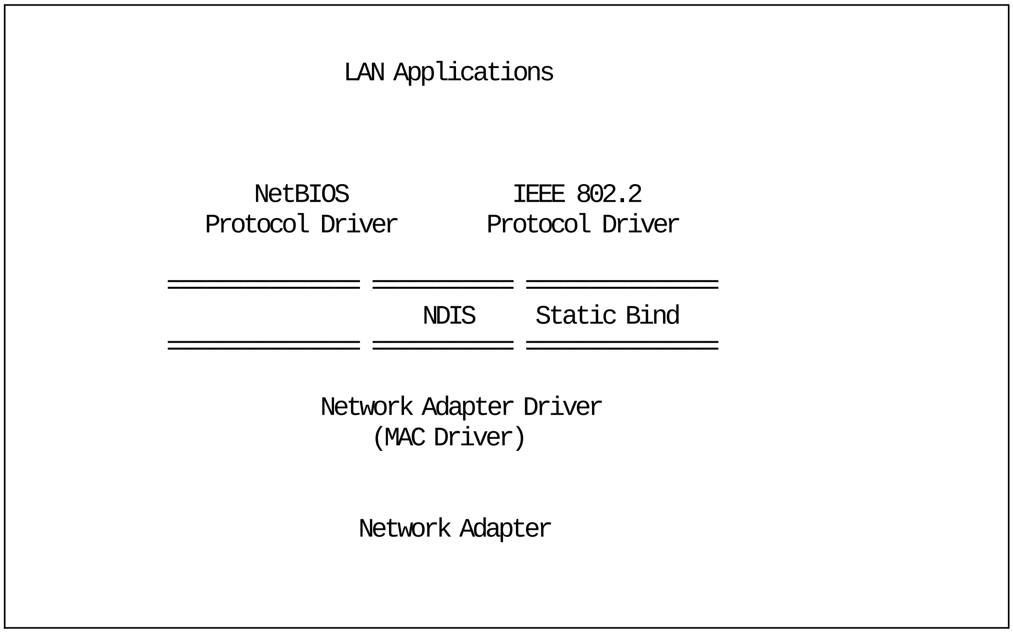


Figure 139. LAPS Relationship to LAN Application

At system startup, MAC driver and protocol driver combinations in the PROTOCOL.INI file are bound together. The binding process allows MAC drivers and protocol drivers to exchange information so that they can communicate. As SNA Phone Connect MAC drivers and protocol drivers provided by Communications Manager/2 support the NDIS interface, these drivers are also bound together.

12.2.2 SNA Phone Connect NDIS MAC Support

Communications Manager/2 provides a set of SNA Phone Connect ANDIS MACs which interface to the existing NDIS protocol stacks in circuit-switched and leased WAN environments (refer to Figure 142 on page 182). These MACs have a couple of communications mode; when in command mode, they communicate with the PCMs in order to receive the commands which lead to the establishment of connections. When the connection is ready, they are switched from a command mode, to a protocol mode, which then allows them to communicate with the protocol stacks for data traffic to take place.

They are therefore dynamically bound to the protocol stacks by the PCM at the required time, when a physical connection becomes available, and they are dynamically unbound when the connection is terminated. The next time around (next connection), the same MAC may be dynamically bound to a different protocol stack, dependent on the conditions and characteristics of the call being made.

However, since the LAN-oriented NDIS 2.01 MAC interface has been designed with a standard *static* bind between the protocol stack and the MAC (makes sense since in LANs, the physical connection is always there), and the protocol stacks have not been changed, virtual MACs were introduced and they are the ones which are statically bound, at PROTOCOL.INI time, to the protocol stacks by the BINDINGS statement present in PROTOCOL.INI. They therefore serve as "place holders" until the dynamic BIND can be done by the PCM at connect time.

Note

Although the NDIS interface is included in ANDIS, at OS/2 startup time, ANDIS MACs are not be used. These MACs are used to communicate with modems when CM/2 starts, but they are bound to VMACs only after a phone connection is established.

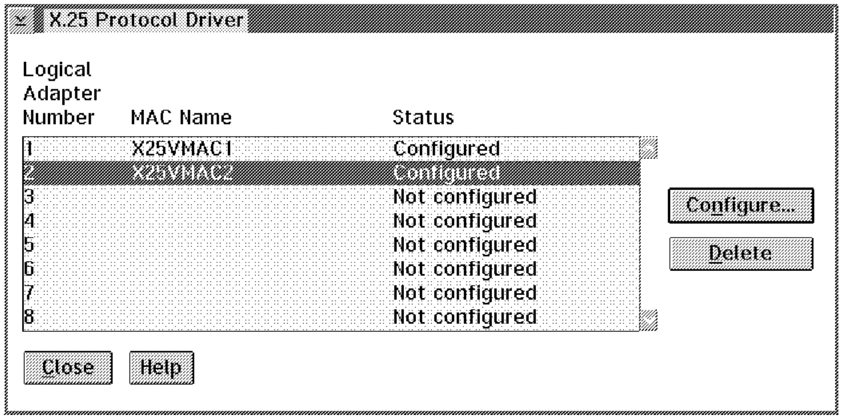
There are four types of protocol drivers and virtual MACs for each of the major protocol types; they are IDLC, SDLC, X.25, and LAN. The virtual MACs are allocated to the logical adapters associated with their protocol type. The logical adapter is not a real piece of hardware but appears real to the applications.

Note

The protocol drivers for IDLC and LAN protocols are only used when communication is over ISDN facilities.

Logical adapters can be configured in the SNA Phone Connect protocol driver profile using CMSETUP, following which the required protocol drivers and MAC drivers are automatically installed.

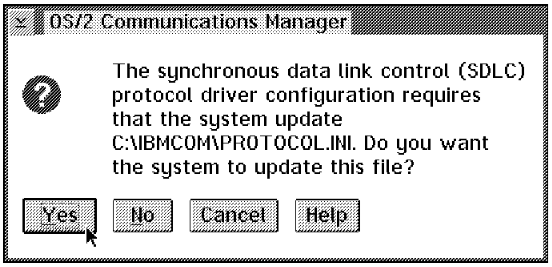
For example, the following window is the X.25 protocol driver configuration panel, showing logical adapters 1 to 3 as configured, and the virtual MAC driver name that each logical adapter can use. These logical adapter numbers shown here are the ones you will reference in the X.25 Link Definition profile.



Logical Adapter Number	MAC Name	Status
1	X25VMAC1	Configured
2	X25VMAC2	Configured
3		Not configured
4		Not configured
5		Not configured
6		Not configured
7		Not configured
8		Not configured

Figure 140. X.25 Protocol Driver Configuration Panel

On the other hand, if you configure the SDLC protocol driver, the panel shown in Figure 141 below is the only panel required which will result in defining two MACs (SDLCVMAC0 and SDLCVMAC1). Although you can theoretically configure up to 127 logical adapters, you can use only two of them simultaneously with SDLC and the user does not have to consider which logical adapter would be used (SDLCVMAC0 or SDLCVMAC1). This is a CM/2 limitation which is planned to be removed shortly.



The synchronous data link control (SDLC) protocol driver configuration requires that the system update C:\IBMCOM\PROTOCOL.INI. Do you want the system to update this file?

Figure 141. SDLC Protocol Driver Configuration Panel

The table below shows the different protocol types and the associated driver names that are used in a switched and leased WAN environment. Also included is all of the NDIS protocol driver information for each protocol type. IDLC and LAN protocols can be used only on ISDN facilities.

Table 3. Protocol Type and Corresponding Protocol Driver

Protocol	**PD Device Driver Name**	**NDIS PD Name**	**Driver Name**
SDLC	SDLCSNET.OS2	SDLC_SWNET	SDLCSNET
IDLC	IDLCPD.SYS	IDLC_PD	IDLS_PD$
X.25	X25DD.SYS	X25_PD	X25PD
802.2 LAN	LANDD.OS2	LANDD_nif	LANDD$
NetBIOS	NETBEUI.OS2	NETBEUI_nif	NETBEUI$

The next table below again lists each of the major protocol types, this time with their corresponding MAC drivers, and associated MAC information. Please note that both the 802.2 and NetBIOS protocol drivers use the same set of MACs. Since both protocol stacks use the IEEE 802.2 LAN LLC layer 2 protocol, both also utilize the same MACs.

Table 4. Protocol Type and Corresponding MAC Driver

Protocol	**Corresponding MAC Device Driver**	**MAC Range Supported**
SDLC	SDLCVMAC.SYS (2 MACs)	SDLCVMAC0,SDLCVMAC1
IDLC	IDLCVMAC.SYS (16 MACs)	IDLCVMAC0-IDLCVMAC15
X.25	X25VMAC.SYS (8 MACs)	X25VMAC1-X25VMAC8
802.2 LAN	LANVMAC.SYS (16 MACs)	LANVMAC_nif00-LANVMAC_nif15
NetBIOS	LANVMAC.SYS (16 MACs)	LANVMAC_nif00-LANVMAC_nif15

The next figure illustrates the relationships between applications, DLCs, protocol drivers, and MAC drivers. The arrows stand for static binds between protocol drivers and virtual MAC drivers. These relationships are established when the PROTOCOL.INI file is initially processed at OS/2 start time; however, no permanent associations exist between virtual MAC drivers and data channel MAC drivers at this time.

```
          NON-SNA                              SNA
        APPLICATIONS                       APPLICATIONS

-------------------------------------------------------------------------------
DLC
                          SNA          X.25        SDLC using    IDLC using
                        LAN DLC        DLC        Phone Conn.   Phone Conn.

-------------------------------------------------------------------------------
API Driver
         NetBIOS        802.2        X25           SDLC          IDLC
PROTOCOL
DRIVERS  NETBEUI.OS2    LANDD.OS2     X25DD.SYS     SDLCSNET.OS2   IDLCPD.SYS


============= = === ====== ========== === ============= ============= ======
VIRTUAL                     NDIS (Static Bind to Logical Adapter Number)
MAC DRIVERS

                    LANVMAC.SYS      X25VMAC.SYS   SDLCVMAC.SYS   IDLCVMAC.SYS
LOGICAL
ADAPTER NUMBER      0 to 15          1 to 8        0 and 1        0 to 15

                        ANDIS (Dynamic Bind per call basis to COM port or MPA)
============= = ==============================================================
ANDIS
MAC DRIVERS             COMMAC.SYS    MPADD.SYS     HAMMAC.SYS    IBMWAC.OS2
         802.5

          IBMTOK.OS2                 MPA Card                     WAC Card


             TRN
            Adapter
```

Figure 142. Protocol and MAC Drivers Relationship Summary

12.2.3 PROTOCOL.INI File

Since the protocol drivers are bound to virtual MAC drivers based on descriptions in the PROTOCOL.INI file, some explanation regarding the organization of the PROTOCOL.INI file seems appropriate here.

For the purposes of the discussion, let′s assume that we have a workstation equipped with one LAN adapter, two COM ports, an MPA adapter and a WAC adapter, and we will be using both LAN communications and WAN SNA Phone Connect communications on this workstation.

We describe this configuration using the next two tables. The first table shows the LAN configuration; that is, one adapter configured as logical adapter 0 over which are using NetBIOS and 802.2 protocols.

Table 5. Sample Configuration for LAPS

Adapter	Protocol	Logical Adapter Number
LAN Adapter	NetBIOS	0
	IEEE 802.2	0

The table below shows the WAN configuration; that is, a COM1 adapter over which we are using an SDLC protocol (the logical adapter could be 0 or 1), a COM2 adapter which is used for an autosync connection (the logical adapter will be 1 if 0 was used for the first COM port), an MPA adapter and a WAC adapter.

Table 6. Sample Configuration for SNA Phone Connect

Adapter and Modem	Protocol	Logical Adapter Number
COM1 (async. switched modem)	SDLC	0 or 1
COM2 (autosync. switched modem)	X.25	1
MPA (sync. leased modem)	SDLC	0 or 1
WAC (sync. switched modem)	X.25	2

If two SDLC links are used for communication, the user does not need to know which logical adapter will be used by each SDLC link as this is handled automatically. In this example, nothing predetermines whether COM1 will use logical adapter number 0 or 1; it could be either one.

Figure 143 on page 185 shows a sample PROTOCOL.INI file which contents reflects the sample configuration data as shown in Table 5 and Table 6 above. The PROTOCOL.INI file consists of the following sections:

- **Protocol Manager**

  This is the first section of a PROTOCOL.INI file. This section is named prot_man. The drivername parameter is specified within this section and has a value of protman$ (refer to 1).

  This section is always required. If you use SNA Phone Connect without any LAN adapters, LAPS installation is still required to install the protocol manager. You can use the /N parameter on a LAPS command to install only protocol manager without all the other LAN related MACs.

- **PROTOCOL.INI configuration information**

  This section is named IBMLXCFG (2) and is used by both LAPS and SNA Phone Connect.

- **Protocol drivers**

  The protocol driver sections for the protocol drivers supplied by LAPS and CM/2 are named LANDD_nif, NETBEUI_nif, X25PD, and SDLC_SWNET (refer to 3).

  Each protocol driver section contains a ***bindings*** parameter. This parameter specifies the section names of the physical or virtual MAC drivers that the protocol driver binds to (refer to 4).

  The order of the MAC driver names in the bindings statement is significant. The first MAC driver specified in the ***bindings*** parameter binds as adapter 0, the second as adapter 1, and so forth, and commas are used if you want to bypass a certain number. (also refer to 4).

- **NDIS MAC drivers**

  The NDIS MAC driver section names are IBMTOK_nif provided by LAPS, and X25VMACx and SDLCVMACx provided by CM/2 (refer to 5).

  Each section contains the configuration information for the MAC driver of each installed network adapter, except in the case of a virtual MAC driver where it contains only the driver name.

  For MAC drivers, the name of a second definition of a MAC driver section has a 1 appended to it, a third definition has a 2 appended to it, and so forth. For example, in the case of X.25, virtual MACs for the SNA Phone Connect are numbered starting with 1, so the name of a second definition of a MAC driver section has a 2 appended, as shown in 5 .

- **PCM names**

  Refer to 6 . These are the PCM entry names which include configuration information for the PCMs. These are not really used or referenced at at OS/2 startup time. The PCM name will be discussed later.

- **ANDIS MAC drivers**

  Refer to 7 . These are the ANDIS MAC driver names which drive COM port, MPA card, and WAC adapter respectively to transmit data to and from a each physical device. These are referred when creating the *PPAT (Physical Port Attribute Table)*.

  > **Note**
  >
  > The PPAT is the basis for the SCPI interface. It contains information such as port name, encoding scheme, connection type (switched or permanent), serial port speed, entry point address, etc.
  >
  > Though the PPAT uses almost all default values when starting OS/2, it will often be changed dynamically when the application (CM/2, LAN Distance and so on) makes outgoing calls or receives incoming calls. This is an internal table that the user cannot modify or access, so it is mentioned here only as extra information.

During OS/2 system startup, the protocol manager reads the parameters of the PROTOCOL.INI file, and after the protocol drivers and MAC driver are loaded, it controls the binding of protocol drivers and MAC drivers. If the protocol manager finds incorrect parameters, the bindings fail. If the protocol manager judges that the protocol driver can be bound to the MAC driver, it makes a static association between protocol drivers and MAC or virtual MAC drivers (refer to Figure 142 on page 182).

```
[PROT_MAN]
   DRIVERNAME = PROTMAN$  1

[IBMLXCFG]  2
   IBMTOK_nif = IBMTOK.nif
   LANDD_nif = LANDD.NIF
   NETBEUI_nif = NETBEUI.nif
   LANVMAC_nif01 = LANVMAC.nif
   LANVMAC_nif02 = LANVMAC.nif

[LANDD_nif]  3
   DriverName = LANDD$
   Bindings = IBMTOK_nif  4
   NETADDRESS = †t400000032281†
   ETHERAND_TYPE = †I†
   SYSTEM_KEY = 0x0
   ...................

[NETBEUI_nif]  3
   DriverName = netbeui$
   Bindings = IBMTOK_nif  4
   ETHERAND_TYPE = †I†
   USEADDRREV = †YES†
   OS2TRACEMASK = 0x0
   SESSIONS = 64
   ....................

[IBMTOK_nif]  5
   DriverName = IBMTOK$
   ADAPTER = †PRIMARY†
   MAXTRANSMITS = 12
   RECVBUFS = 10
   RECVBUFSIZE = 256
   XMITBUFS = 2

   .....
   .....
[SDLC_SWNET]  3

   DRIVERNAME = SDLCSNET
   BINDINGS = SDLCVMAC0, SDLCVMAC1  4
   CFGTYPE = Locked

[X25PD]  3

   DRIVERNAME = X25PD
   CFGTYPE = Locked
   BINDINGS = X25VMAC1, X25VMAC2, , , , , ,  4

[X25VMAC1]  5

   DRIVERNAME = X25VMAC
   CFGTYPE = Locked

[X25VMAC2]  5

   Drivername = X25VMAC
   CfgType = Locked
```

Figure 143 (Part 1 of 3). Sample PROTOCOL.INI File

```
[SYNCSW]  6

   DIALOGTYPE = †V25BIS.DDF†
   SYNCHRONICITY = †Synchronous†
   PORTNAME = MPA0
   ACCPTINCCALL = †NO†
   PERMCONNECTION = NO
   ENCODINGSCHEME = †NRZI†
   ........................

[IBM7855]  6

   DIALOGTYPE = †ATCMD.DDF†
   SYNCHRONICITY = †Asynchronous†
   PORTNAME = COM1
   ACCPTINCCALL = †NO†
   MODEMCLASS = †V.32†
   SERIALPORTSPEED = 19200
   .....................

[AOPTIM14]  6

   DIALOGTYPE = †HAMCMD.DDF†
   SYNCHRONICITY = †AutoSync†
   PORTNAME = COM2
   ACCPTINCCALL = †NO†
   MODEMCLASS = †V.32bis†
   SERIALPORTSPEED = 38400
   ....................

[SYNCSW0]  6

   DIALOGTYPE = †V25BIS.DDF†
   SYNCHRONICITY = †Synchronous†
   PORTNAME = WAC0
   ACCPTINCCALL = †NO†
   PERMCONNECTION = NO
   ENCODINGSCHEME = †NRZI†
   ....................

[MPADD_NIF]  7

   DRIVERNAME = MPAMAC$
   PORTNAME = †MPA0†
   LINE_MODE = †FULL_DUPLEX†

[ADLCMAC_NIF]  7

   DRIVERNAME = ADLCMAC$
   PORTNAME = †COM1†
   PCMCIA = †NO†
   RX_FIFO_SIZE = 8
   TX_FIFO_SIZE = 8

[HAMMAC_NIF]  7

   DRIVERNAME = HAMMAC$
   PORTNAME = †COM2†
   PCMCIA = †NO†
   RX_FIFO_SIZE = 14
   TX_FIFO_SIZE = 14
```

Figure 143 (Part 2 of 3). Sample PROTOCOL.INI File

```
[IBMWAC_NIF]  7

   DRIVERNAME = IBMWAC$
   WACCARDNUM = 2
   WACPORTNUM = 0
   RAMADDRESS = 0x0D0000
   RTS = 0
   NRZI = 0
   RS232MODE = 0
   X21MODE = 0
   LINESPEED = †9600†
   MAXDATA = 4486
   MACTYPE = †HDLC†
   MAXTRANSMITS = 8
   PCMSUPPORT = 0
   CONNTYPE = 1
   PORTNAME = †WAC0†
   FLAGS = 1
```

Figure 143 (Part 3 of 3). Sample PROTOCOL.INI File

12.3 Main Events at CM/2 Start Time

When CM/2 starts, the environment manager is the first module to get control and it′s task is to start other components. The first component that gets started, when SNA Phone Connect is configured, is the Module Enabler, whose responsibility it is to start all the SNA Phone Connect components. The Module Enabler loads and initializes PCMs, then it starts the CNM manager and passes the list of active PCMs so that the CNM manager can establish communication with these PCMs, and then it starts the Connection Manager and also passes the list of active PCMs so that the Connection Manager can establish a communication pipe with each PCM.

Refer to Figure 145 on page 190 which illustrates the sequence of events at startup and a step-by-step activation flow. In the discussion below, we refer to the numbers in the figure in order to explain each step.

First, the Environment Manager starts the Module Enabler, which in turn reads NETWORK.INI (1) to find out which PCMs should be initialized. It gets the PCM′s DLL name (for example, ACSVSPCM, as shown in the sample NETWORK.INI in Figure 144 on page 188), the PCM′s name (IBM7855), and the entry points, and then loads the PCM.

```
[CXM]
   NETWORKTYPE = DMS

[NETWORKDEFS]
   ANALOG = †Analog network†,NETWAE2.SUP,SNAPHONE.CXM
   DMS = †DMS100†,NET_00.SUP,SNAPHONE.CXM

[PROT_MAN]
   DRIVERNAME = PROTMAN$

  ..........................
   DLL = ACSVSPCM
   ENTRY = StartVPCM
   PIF = IBM7855.PIF
   PCMNAME = IBM7855
   AUTOSTART = YES
   TITLE = IBM 7855 Modem
  ..........................
```

Figure 144. Sample NETWORK.INI File

The Module Enabler uses DosLoadModule to load the PCM DLLs and then uses DosGetProcAddr to obtain the address of the defined initialization entry point for each DLL (refer to 2).

Note

Though the Module Enabler reads all PCM entries, it only initialized those specified as ′AUTOSTART = YES′.

Once loaded, a PCM issues a GET_CONFIG command to the Module Enabler to obtain its configuration information (refer to 3). The configuration information is retrieved by the Module Enabler from the PROTOCOL.INI file where it was stored when the user configured the PCM. This information includes parameter values such as DIALOGTYPE, SYNCHRONICITY, PORTNAME, SERIALPORTSPEED, and so on. Refer to [PCMNAME] block in Figure 143 on page 185 6 .

In 4 , the Register_PCM primitive is issued to the MAC by the PCM in order to exchange entry points with the MAC. This binding between a PCM and a MAC through the SCPI (Switched Connection Path Interface) interface, which is a part of ANDIS, is equivalent to an NDIS bind in LAPS. At that moment, this MAC is owned by this PCM.

Note

Primitives will be discussed a bit more in the SNA Phone Connect problem determination chapter; however, for now, .req stands for a request primitive, .cnf is a confirmation primitive and .ind is an indication primitive.

Once active, a PCM issues a REG_MODULE to the Module Enabler (refer to 5) indicating that it is now to be considered an active PCM. A control block passed both the entry point address for activating service access points (SAPs) and the version number of the PCM to the Module Enabler. This is so that the Module Enabler can then communicate to the CNM manager and the Connection Manager the list of all the PCMs which are active.

After a PCM is registered, it is ready to communicate with the Connection Manager (CXM) and CNM Manager. Before this communication can occur though, the CXM and CNM Manager must activate a service access point (SAP) to the PCM. Using the list of the PCMs given to them by the Module Enabler, they issue a PCM_Activate_SAP.request primitive (6 and 8) to each PCM and then pass each entry point address to the PCM.

If the Connection Manager gets a normal reply from the PCM, it means they have been bound together through GCCI. The PCM_Activate_SAP.confirm primitive contains the PCM entry point address and a data information field that provides the Connection Manager with information like the local number (12). For more information on the SAP, primitive, and GCCI interface, refer to 13.2.1, "APIs and Primitives" on page 202.

Between the CNM Manager and PCM, the same primitives flow (7); however, these primitives are for accessing RAS functions.

While some of the Connection Manager and CNM Manager initialization tasks are taking place, each PCM proceeds with issuing commands across the SCPI interface, to the MACs that they own, for the purposes of preparing for communication. The PCM issues a Get_PPAT_Parm to obtain the parameter values set in the PPAT table by the Protocol Manager at OS/2 startup, and to set/reset some of these values in order to reflect the characteristics of this particular PCM, which owns this MAC at this time 9 .

Next, the PCM issues an Activate_Phys_Conn command to request the MAC to activate a physical connection from the physical device to the modem. As a result, the MAC raises the Data Terminal Ready (DTR) and Request to Send (RTS) leads on cable leading to the modem 10 .

The PCM then issues TransmitImmediateData commands to the MAC, which contains the data strings required to initialize the modem and receives ReceiveImmediateData primitives which contain the responses from the modem 11 .

The SNA subsystem then issues a CM_Activate_SAP.req primitive through the CMI interface to register itself, as an application, and open communications with the Connection Manager 13 .

The SNA subsystem then issues an EnableIncomingCalls.req command to request the Connection Manager to create a new entry in its incoming call routing table 14 . As a result, the SNA application can receive routed and filtered incoming calls properly.

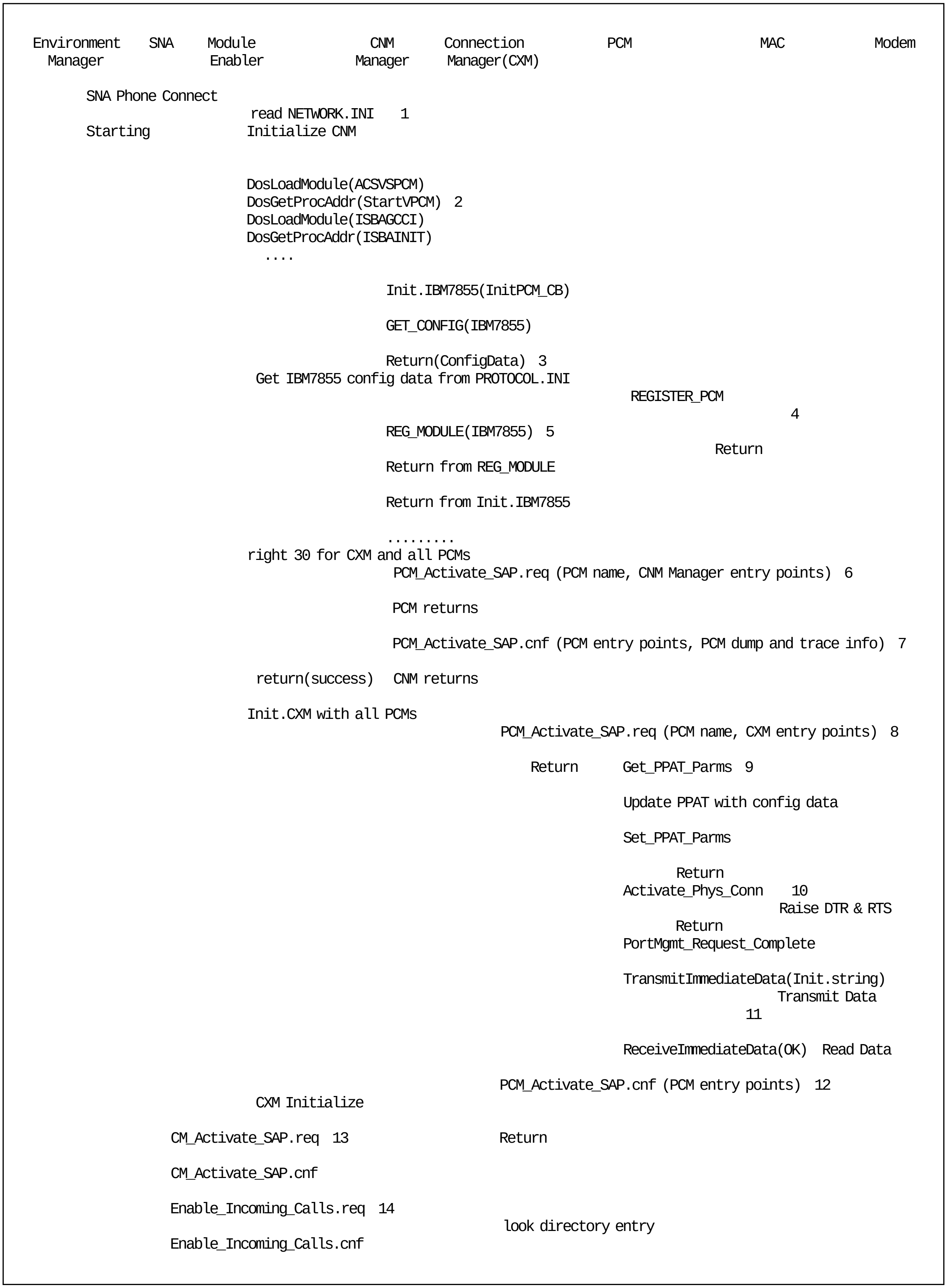


Figure 145. Connection Manager and PCM Activation Flows

At this time, if you were to issue a `CMQUERY` command, you would see the result as shown below where the SNA Phone Connect service displays as ACTIVE.

```
               Communications Manager Query Services

     Workstation Type      : Single User
     Default configuration : BASIC
     Active configuration  : basic

      Service                          Status
     ══════════════════════════════════════════════════════════
       Kernel                           ACTIVE
       SNA Services                     ACTIVE
       SRPI                              *** Stopped ***
       X.25                              *** Stopped ***
       SNA Phone Connect                ACTIVE
       ACDI                              *** Stopped ***
       3270 Emulator                    ACTIVE
       5250 Emulator                     *** Stopped ***
     ══════════════════════════════════════════════════════════
     Friday, 08/26/94 00:15:39   End of Program - CMQuery
```

Figure 146. CMQUERY Command Showing SNA Phone Connect as Active

12.4 Outgoing Call and Incoming Call Flow Examples

We now use the example of an SNA Application (which could be a 3270 emulator session, or an APPC application) placing a call, using the SDLC protocol, in order to illustrate the events that take place when making an outgoing call.

Figure 149 on page 194 shows some of the relationships between the applications, the DLCs, the protocol stacks, the MAC drivers, and the different types of adapters.

In this example, the workstation has an MPA card, a WAC adapter, and two COM ports; it has been configured based on Table 5 on page 183 and Table 6 on page 183. Assume that, at the time we place this additional call, this workstation already has active connections with other systems using the MPA card, the WAC adapter and the COM2 port for SNA applications such as APPC or 3270 emulators. Note that the SNA applications are using the X.25 and the SDLC protocol stack.

12.4.1 Outgoing Call

Figure 150 on page 195 and Figure 151 on page 196 show the sequence of events when an application, say a 3270 emulator session, makes a request to establish an outgoing call.

Assume that the SNA 3270 emulator has been started. First, the SNA subsystem activates an SDLC DLC for virtual port #3 because this port is used by the LINK configured in the 3270 Emulator profile and is now available, as shown in 1 .

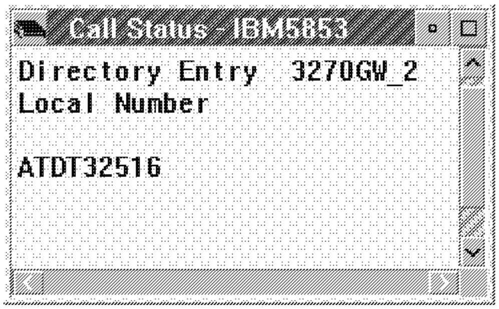
The SNA subsystem interfaces with the Connection Manager through the Connection Manager Interface (CMI). The SNA subsystem requests the

Connection Manager to initiate an outgoing call by issuing a CallEstablish.req primitive, as shown in 2 .

When the Connection Manager receives the CallEstablish.req primitive, it searches the SNAPHONE.CXM file for an outgoing call directory entry which matches the name supplied in the CallEstablish.req primitive, finds in this directory entry the type of circuit (and therefore type of PCM) required and then issues a CallSetup.req to the appropriate PCM, as shown in 3 . The PCM then transmits the request to the port that it owns. If the PCM owns multiple ports that can satisfy the request, it selects one of the available ports.

If the Connection Manager receives a CallSetup.cnf successfully, the Call Status application will display a window on the screen indicating the call status, as shown below in Figure 147. The Call Status application is one of the applications which uses the CMI API. The information displayed includes the following information:

- Name of the PCM in the title bar
- Name of the outgoing call directory entry
- Local telephone number of the modem used to make the call
- List of all commands and status strings received from the modem



Directory Entry 3270GW_2
Local Number

ATDT32516

Figure 147. Call Status Window -Calling-

Note

SNA Phone Connect displays the Call Status window to allow the user to monitor the status of calls being auto-dialed through the modem. This window appears whenever a switched connection over a modem or a CSU/DSU is initiated by your workstation. It continues to display the status of the call as the call progresses but it disappears ten seconds after a successful connection has been established.

The PCM then sends the modem commands strings required, including the telephone number, by issuing the TransmitImmediateData primitive to the MAC(COMMAC) because this PCM owns the MAC for COM port #1. Refer to 4 .

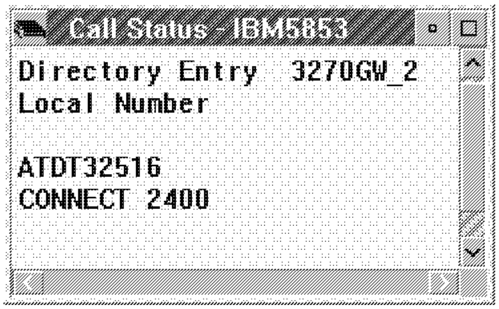
After a telephone connection is established, the modem sends a signal which indicates that DSR and CD are already set to the MAC (refer to 5). Next, the MAC issues a Connection_Active primitive to the PCM to indicate that a data connection has been established between two modems.

The PCM then sends a command to the MAC in order to switch the MAC to PROTOCOL mode so that the MAC can then start to communicate with the appropriate protocol stack for data transfer to take place, as shown in 6 .

Note

There are two modes for the ANDIS interface: a CONNECT (COMMAND) mode and a PROTOCOL mode. In CONNECT mode, the MAC communicates with the PCM (via SCPI) to manage the physical connection. In PROTOCOL mode, the MAC communicates with the protocol driver (via NDIS).

The PCM issues a CallConnected.ind primitive to the Connection Manager, when the PCM receives a connection active notification from the MAC, to indicate to the Connection Manager that an end-to-end connection has been established through the network and that the channel is ready for data transfer (refer to 7). If the Connection Manager receives a CallConnected.ind successfully, the Call Status Application will display, in the Call Status window, the CONNECT indication, as shown below in Figure 148. This panel indicates that the connection has been successfully established.

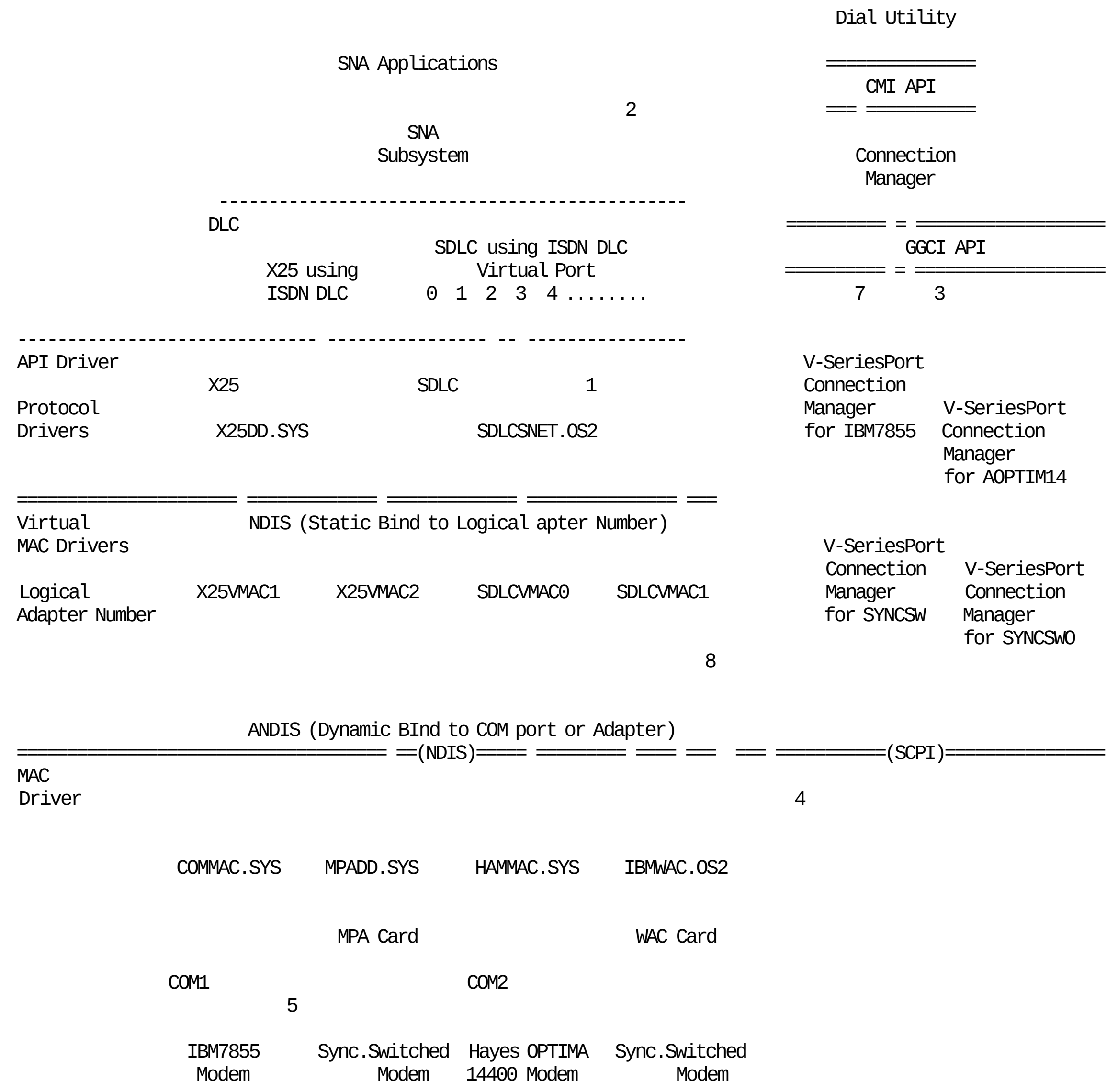


```
Directory Entry  3270GW_2
Local Number

ATDT32516
CONNECT 2400
```

Figure 148. Call Status Window -Connect-

Then, the VMAC is dynamically bound to the MAC (COMMAC.SYS), which really drives the COM ports, as shown in 8 . In this case, since the logical SDLC adapter, SDLCVMAC1, is available, it is bound to COMMAC.SYS to drive COM1.

The Connection Manager sends a CallConnected.ind to the SNA application when the PCM has established a physical connection with the remote party. At this time, the data channel is now available for use (refer to 9) and application data can flow, such as an XID negotiation for example to activate a logical link, as shown in 10 .



6 , 9 , and 10 are not shown here. See Figure 150 on page 195.

Figure 149. How the PCM and Connection Manager Work when Making an Outgoing Call

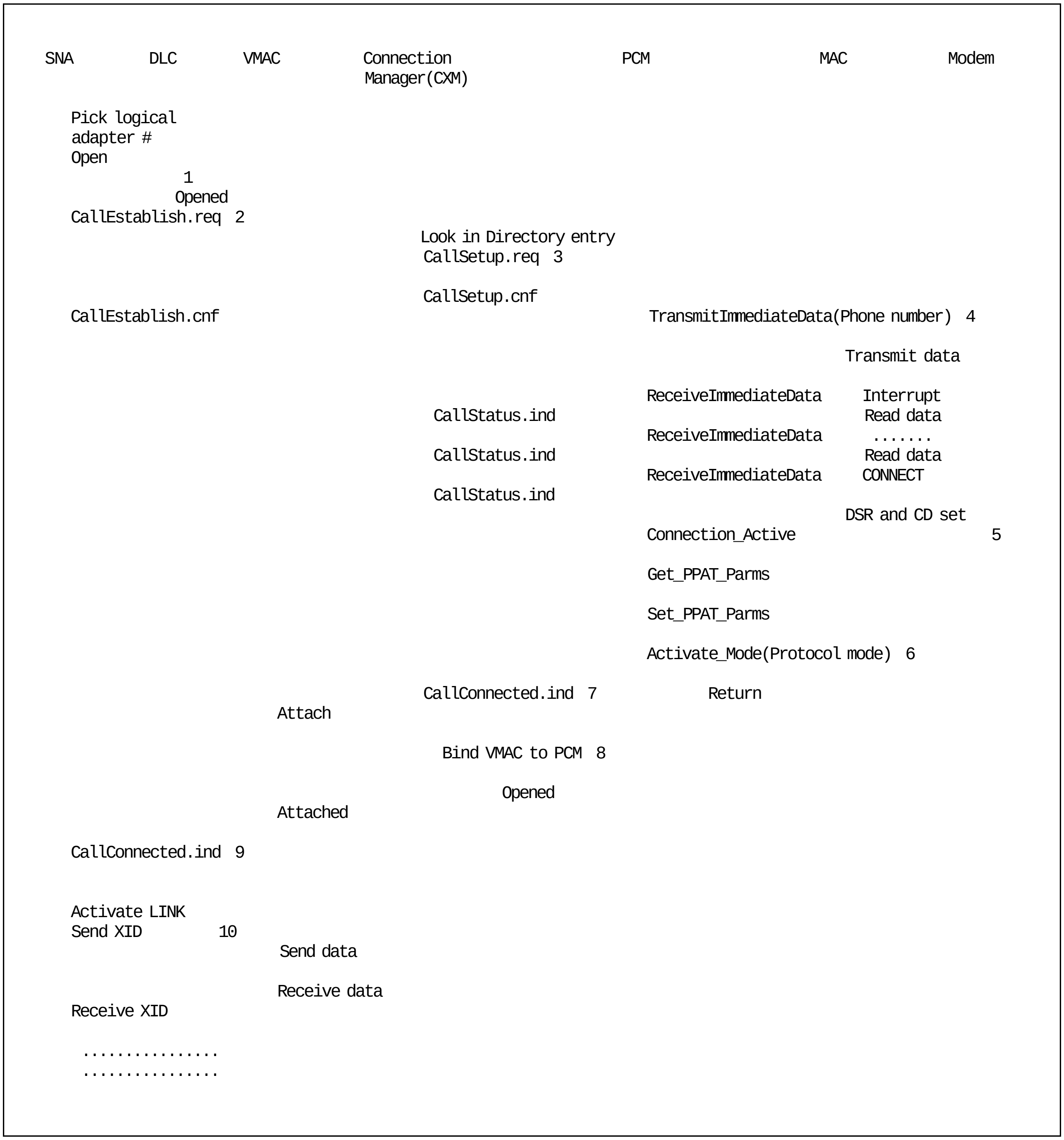


Figure 150. Connection Manager and PCM Activation Flow when Making an Outgoing Call

12.4.2 Incoming Call

Let's now take a brief look at the case of an incoming call. Please refer to Figure 151 on page 196 for the following discussion.

When a call arrives from a remote workstation, the PCM receives a ReceiveImmediateData primitive indicating RING and informs the Connection Manager of an incoming call by issuing a CallSetup.ind, as shown in 1 .

The Connection Manager then evaluates the information in the CallSetup.ind primitive to find out what type of call it is, and searches the SNAPHONE.CXM for an incoming call directory entry whose parameters match the information, for example, synchronous or asynchronous etc., in the primitive. When a match is found, it issues a CallEstablish.ind to inform the application of an incoming call, as shown in 2 . If the incoming call directory entry has been created to accept any call, then there is no match required for modem type or phone number.

A CallEstablish.rsp primitive is then issued by the application to the Connection Manager to indicate whether it is ready to accept the call, or reject the call, or whether it needs more time to prepare to accept the call. In most cases, the application does require a bit more time in order to start an APPC application for example, so it responds with a status of pending as shown in 3 .

When the application is ready to accept this call, the SNA subsystem sends a CallControl.req primitive to request a change in status from incoming call to accept the call, as shown in 4 .

After the Connection_active primitive is received, the rest of the events (5) are pretty similar to the outgoing call sequence that we have already seen.

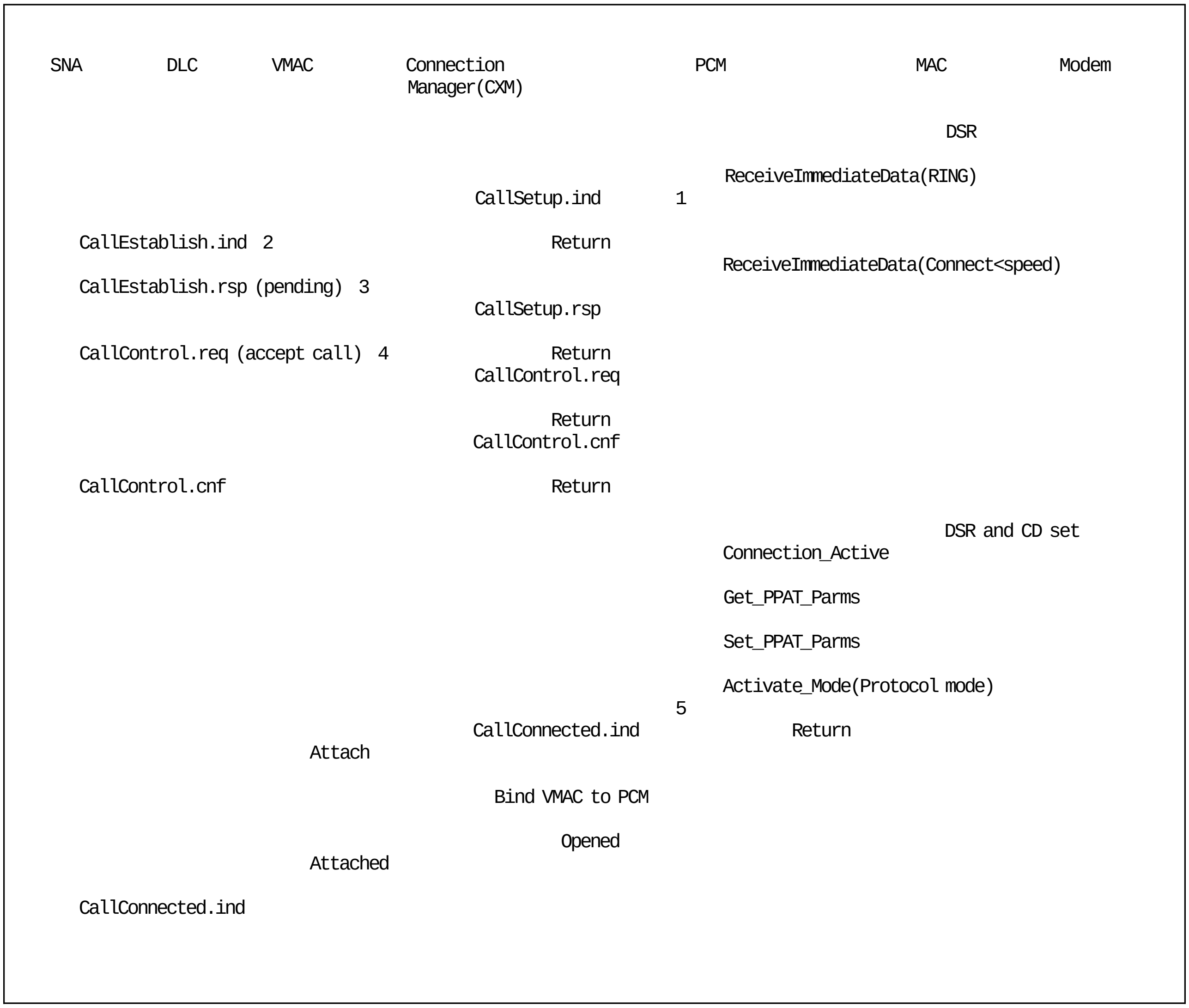


Figure 151. Connection Manager and PCM Activation Flow when Accepting an Incoming Call

Chapter 13. Problem Determination for SNA Phone Connect

When you need to get into problem determination mode because you are not getting the connections you expect, one of the first thing to remember, when dealing with switched connections, is to separate the events related to establishment of a physical connection over the telephone network from the events related to SNA communications once you have an active connection.

Therefore, if you fail to establish communication with a remote site before any SNA data begins to flow, you may have to look for a problem on the physical line, but if you do get a physical connection active but are still having trouble communicating, you might need to take a trace at the SNA DLC level or use SNA subsystem management to see whether the link or session is coming up cleanly.

One of the first place that a user should look for indications of what might be wrong is the FFST/2 Message Log Formatter and FFST/2 Error Log. If any error messages were issued, they will appear in these log and give you a starting point. If these logs do not contain any messages or error indication, your next step might be to use the CM/2 tracing facilities.

In this chapter, we will focus only on problems related to the establishment of the physical link for SNA Phone Connect circuits. Problems at the SNA session level will not be discussed. For more information on SNA level types of problems and CM/2 problem determination examples, please refer to *CM/2 Concepts, Scenarios and PD Examples, GG24-4183*.

As well, if you are using ISDN, then please refer to *Communication Manager/2 Version 1.1 Enhancements, GG24-4142* for ISDN related problem determination information.

This chapter consists of the following three sections:

- **Message Log Formatter**

  How to access the message log formatter.

- **CM/2 Tracing**

  How to take a CM/2 trace, what to trace and trace examples for SNA Phone Connect.

- **Hints and Tips**

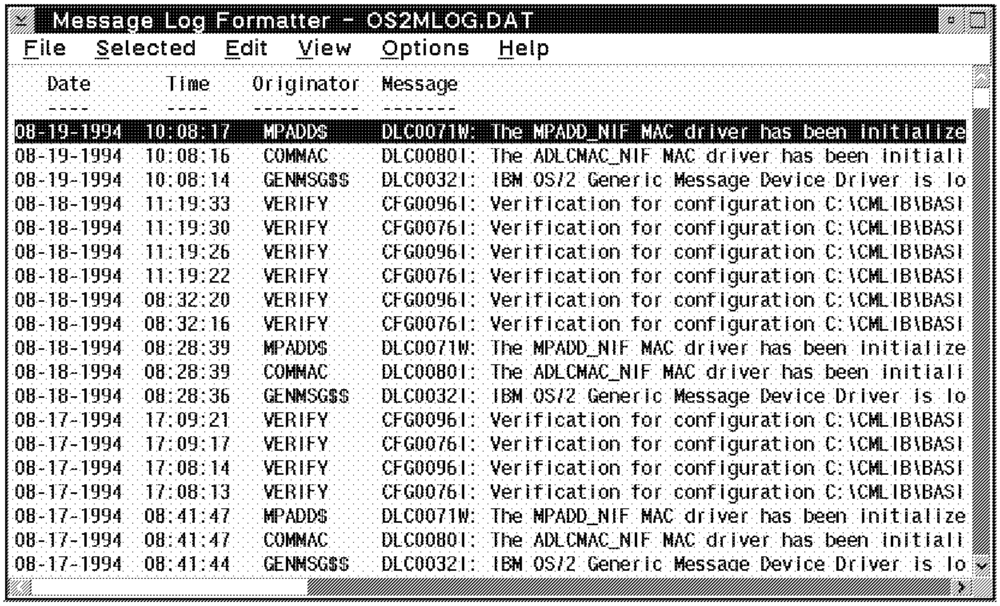
  A few miscellaneous pointers to help with problem determination.

13.1 Message Log Formatter

All system messages, whether originating in CM/2 or other applications, are logged into one system message file called OS2MLOG.DAT.

To see these messages, the FFST/2 subsystem provides a utility called the Message Log Formatter, which can be found in the FFST/2 folder. Use the Message Log Formatter to display the messages, as shown in Figure 152 on page 198 below. This window displays all the messages in chronological order, with the most recent at the top, and only one line per message.

© Copyright IBM Corp. 1995

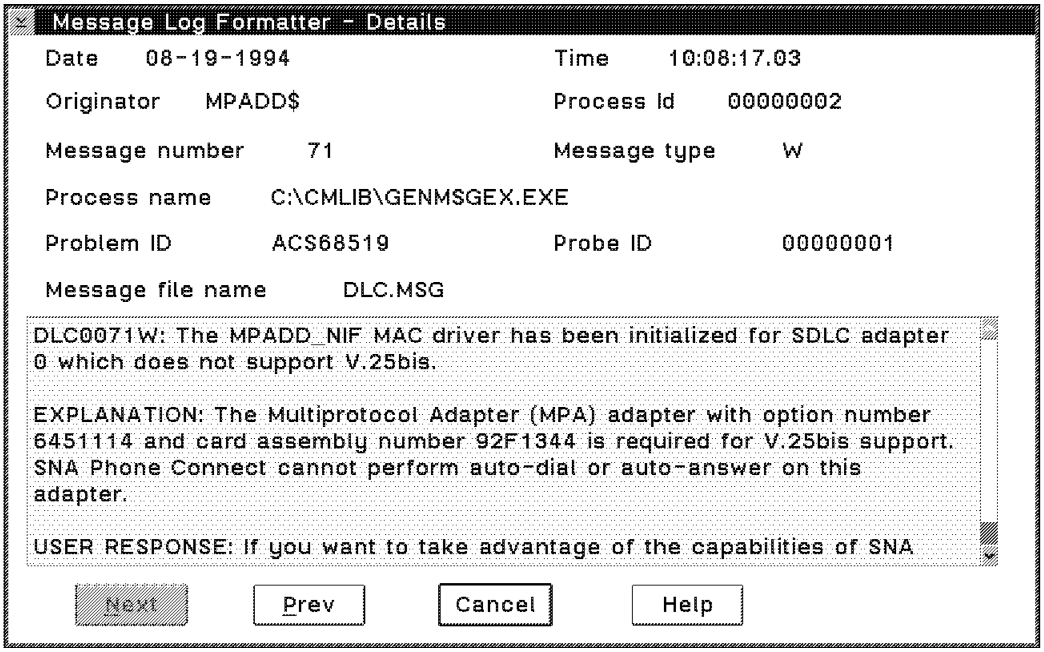


```
 Date        Time      Originator  Message
 ----        ----      ----------  -------
08-19-1994  10:08:17   MPADD$      DLC0071W: The MPADD_NIF MAC driver has been initialize
08-19-1994  10:08:16   COMMAC      DLC0080I: The ADLCMAC_NIF MAC driver has been initiali
08-19-1994  10:08:14   GENMSG$$    DLC0032I: IBM OS/2 Generic Message Device Driver is lo
08-18-1994  11:19:33   VERIFY      CFG0096I: Verification for configuration C:\CMLIB\BASI
08-18-1994  11:19:30   VERIFY      CFG0076I: Verification for configuration C:\CMLIB\BASI
08-18-1994  11:19:26   VERIFY      CFG0096I: Verification for configuration C:\CMLIB\BASI
08-18-1994  11:19:22   VERIFY      CFG0076I: Verification for configuration C:\CMLIB\BASI
08-18-1994  08:32:20   VERIFY      CFG0096I: Verification for configuration C:\CMLIB\BASI
08-18-1994  08:32:16   VERIFY      CFG0076I: Verification for configuration C:\CMLIB\BASI
08-18-1994  08:28:39   MPADD$      DLC0071W: The MPADD_NIF MAC driver has been initialize
08-18-1994  08:28:39   COMMAC      DLC0080I: The ADLCMAC_NIF MAC driver has been initiali
08-18-1994  08:28:36   GENMSG$$    DLC0032I: IBM OS/2 Generic Message Device Driver is lo
08-17-1994  17:09:21   VERIFY      CFG0096I: Verification for configuration C:\CMLIB\BASI
08-17-1994  17:09:17   VERIFY      CFG0076I: Verification for configuration C:\CMLIB\BASI
08-17-1994  17:08:14   VERIFY      CFG0096I: Verification for configuration C:\CMLIB\BASI
08-17-1994  17:08:13   VERIFY      CFG0076I: Verification for configuration C:\CMLIB\BASI
08-17-1994  08:41:47   MPADD$      DLC0071W: The MPADD_NIF MAC driver has been initialize
08-17-1994  08:41:47   COMMAC      DLC0080I: The ADLCMAC_NIF MAC driver has been initiali
08-17-1994  08:41:44   GENMSG$$    DLC0032I: IBM OS/2 Generic Message Device Driver is lo
```

Figure 152. Message Log Formatter Panel

If you want to display only certain types of messages in the list above, you can use the View/Include pull down to give the characteristics of the messages that you want displayed. For example, if you only wanted to see the message issued by SNA Phone Connect, you could specify SNAPHONE as the originator.

In this case, we only want to select the last (top) message and get additional details about this message, by double clicking on the entry. The display will be as shown below in Figure 153.



Date 08-19-1994 Time 10:08:17.03

Originator MPADD$ Process Id 00000002

Message number 71 Message type W

Process name C:\CMLIB\GENMSGEX.EXE

Problem ID ACS68519 Probe ID 00000001

Message file name DLC.MSG

DLC0071W: The MPADD_NIF MAC driver has been initialized for SDLC adapter 0 which does not support V.25bis.

EXPLANATION: The Multiprotocol Adapter (MPA) adapter with option number 6451114 and card assembly number 92F1344 is required for V.25bis support. SNA Phone Connect cannot perform auto-dial or auto-answer on this adapter.

USER RESPONSE: If you want to take advantage of the capabilities of SNA

Figure 153. Message Log Formatter Detail Panel -Example 1-

This detailed panel gives an explanation of the message and what the user response can be. In this case, the MPA card used by CM/2 does not support auto-dial or answer for SNA Phone Connect communication.

13.2 CM/2 Tracing

Very often, the case will arise where the messages issued by the system are not sufficient for you to determine and pinpoint the cause of the problem, or simply that there aren′t any messages issued.

The first step to take is to use all the facilities of the subsystem management to monitor the status of the different resources involved, and then if this does not show you any additional clues, then tracing often becomes the only viable option to do further problem determination. Fortunately, the CM/2 tracing facility is very easy to use and very user friendly.

Please refer to Figure 154 below. This diagram shows the protocol layers of the OSI model that SNA Phone Connect supports; however, note that this figure does not include protocols which can be used over ISDN (802.2 and NetBIOS).

```
Layer 4-7               * SNA    *             * marked layer can
                                                 be seen by CM trace
             *non-SNA  ---------               ** marked layer can be seen
                         QLLC        SNA         not by CM trace
                                                 but by protocol analyzer
             *X.25 Packet Level                *** marked layer,
Layer 3              X.25 Call                   only XID exchanges can be
                     X.25 Data                   seen by CM trace

             *X.25 Frame Level   ***
Layer 2             LAP-B            SDLC


             **
Layer 1          Telephone Line Connection
```

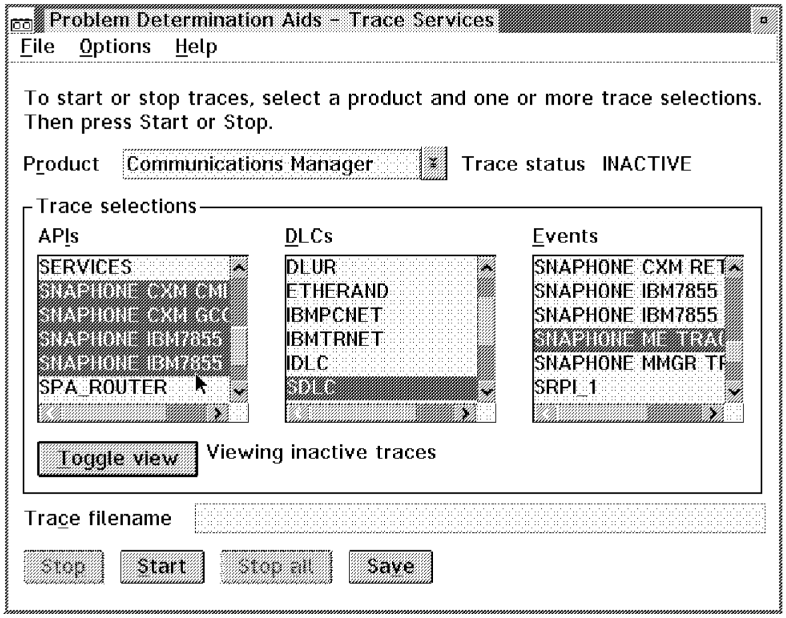
Figure 154. A Part of OSI Layer Model that Communications Manager Implements

As described in the flows illustrated in Chapter 12, “Communications Manager/2 SNA Phone Connect Environment” on page 173, there are many events that need to take place before you can get an actual physical telephone connection.

All the APIs between the SNA Phone Connect components can be traced so that you can see the primitives being exchanged between the different components, and although you cannot see the flows between the modems using the CM/2 tracing facility, you can certainly see all the commands that are issued to the modem by the PCMs.

So, what can you trace and what should you trace when you have an SNA Phone Connect problem? Furthermore, how do you take a trace?

For CM/2, there is an icon in the CM/2 folder called ″PD Aids - trace″. Clicking on this icon displays the panel shown below (Figure 155 on page 200) which is your PM interface to tracing.



To start or stop traces, select a product and one or more trace selections. Then press Start or Stop.

Product: Communications Manager

Trace status: INACTIVE

Viewing inactive traces

Trace filename:

Figure 155. Problem Determination Aids -Trace-

Reminder

Remember that this trace facility is a process independent from CM/2, that is, you do not need to have CM/2 active to start a trace. This would be used in cases where you want tracing to be done during CM startup for example.

Second, you must select the items that you need to trace. The trace selection window has three areas:

- The API list box, where you select which APIs you want to trace. For SNA Phone Connect, the trace point names all start with SNAPHONE. We will discuss, in a moment, which ones are appropriate to choose.
- The DLCs list box, where you select the DLC appropriate to the type of adapter that you are using. In the case of SNA Phone Connect, this will be SDLC most of the time or could be X.25 or IDLC.
- Events - This is usually for in depth tracing of special events, and you (as a user) seldom have to use this. However, there are a few here that are very useful. One of these is the APPC_XID, which you need whenever you want to trace the events related to the activation of a logical link, and, for SNA Phone Connect, the entries with the PCM name followed by DIALOG and EVENTS will be very useful to see the exchange of commands with the modem.

Once these trace points have been selected, all you need to do is to hit the start button for the trace to start accumulating records.

Once the event that you want to capture has taken place, say a link activation, you can then stop the trace, specify a filename and click on SAVE. At this point, this file contains the raw trace records that have been captured.

The next step that you would normally take, if you were tracing for APPC activity for example, would be to format the raw trace. However, note that for SNA Phone Connect, there is no formatting available but there is none required either as the first two lines of each unformatted trace record contains all you need to identify what the trace record is.

Now, let's discuss briefly which trace points should be selected when working with SNA Phone Connect, and which ones should be avoided. The figure below (Figure 156) identifies the SNA Phone Connect related trace points that are selectable.

```
APIs                                            Events

SNAPHONE CNM GCCI                               SNAPHONE ME TRACE
                              Applic.

                          ====== CMI =====      SNAPHONE CXM MEMORY
SNAPHONE CXM CMI                                SNAPHONE CXM MODULE
                               CXM              SNAPHONE CXM QUEUE
SNAPHONE CXM GCCI                               SNAPHONE CXM RETURN CODE
                          ====== GCCI =====
SNAPHONE <pcmname> GCCI
                            Modem PCM
SNAPHONE <pcmname> SCPI
                          ====== SCPI =====

                             ANDIS MAC          SNAPHONE <pcmname> DIALOG
                                                SNAPHONE <pcmname> EVENT
```

Figure 156. Selectable Trace Points

- First, on the left-hand side, under APIs, the first entry there is named SNAPHONE CNM GCCI and this is used to trace the interaction between the CNM manager and the PCMs.

  Important

  Do not select this trace point. If you do, you will get, for every trace record logged, multiple CNM GCCI records logged, which are *not* required and will not help you. On the other hand, this will make your life more difficult by quadrupling the size of the trace and filling it with useless information.

- Next, under Events on the right hand side, is an EVENT called SNAPHONE ME TRACE that can be selected to monitor the MODULE ENABLER activities. This need only be used if you suspect that something is wrong at CM start time. Otherwise, it is unlikely that this will be useful to you.
- Next are all the CXM Trace Points under Events. Again it is unlikely that you, as a user, will have any need for these or be able to use any of the information from these trace points; so, our recommendation is to forget about these.
- As for the two other CXM trace points under the API section, they would be chosen if you need to see the primitives that are exchanged by the Connection Manager across the CMI and GCCI interfaces. Our opinion is that, unless you wrote your own application which uses the CMI API, it is unlikely again that information gathered here will be useful to you to fix any

problem, since such a problem would likely originate in the SNA subsystem and should be looked at by the developers of the product.

- This leaves us with the PCM trace points. These will have the name SNAPHONE <pcmname> tracepoint, where "pcmname" will be the name of whatever PCM you are using.

  Note: Trace points for a PCM get added to the PM trace interface when they first get used, but they are not removed from RAS even when you delete the PCM from a configuration. So, do not be surprised to see trace points remain selectable even if the PCM has been deleted; this does not do any harm, and these will disappear when you reinstall CM/2.

  The SNAPHONE pcmname GCCI, and in particular SCPI, are useful, to a certain extent, to see the interaction between the PCM and the MAC. As well, the SNAPHONE pcmname DIALOG and EVENTS are probably the most useful ones because they show all the exchange of commands between the PCM and the modem, which is where your problem will be most of the time when dealing with SNA Phone Connect.

  In summary, our recommendation is that, if you are having problems mainly with the establishment of a physical connection, that these four last pcmname trace points mentioned should be the ones to use first.

13.2.1 APIs and Primitives

Unless you are an application development type of user, it is unlikely that you will ever need to deal with the primitives exchanged at the API level.

However, should you have a need for this, or the urge to understand a bit more how these interfaces function, we are presenting here a very brief summary of these APIs and primitives. For more information, please refer to *ISDN Connection Manager Interface (CMI) Programming Reference* (available in softcopy only) and *ISDN Port Connection Manager (PCM) Programming Reference* (available in softcopy only).

The explanations given here refer to Figure 157 on page 205.

Shown in 1 is the Connection Manager Interface (CMI), which is an asynchronous type of interface. An application can communicate with the Connection Manager through this interface by using data structures called primitives. The four types of primitives used to communicate with the Connection Manager are:

Request	Issued by your application to request a service from the Connection Manager
Confirm	Issued by the Connection Manager to reply to a request primitive
Indication	Issued by the Connection Manager to inform you that an event has occurred that your application should be aware of
Response	Issued by your application to respond to an indication primitive

Table 7 on page 203 lists the CMI primitives. If you need further information about the CMI primitives, refer to *ISDN Connection Manager Interface (CMI) Programming Reference* (available in softcopy only).

Table 7. CMI Primitives

Primitive Name	REQUEST	CONFIRM	INDICATION	RESPONSE
CM_ACTIVATE_SAP	X	X		
CM_DEACTIVATE_SAP	X	X	X	
CM_CALL_ESTABLISH	X	X	X	X
CM_CALL_CLEAR	X	X	X	X
CM_CALL_CONNECTED			X	
CM_ENABLE_INCOMING_CALLS	X	X		
CM_DISABLE_INCOMING_CALLS	X	X		
CM_CALL_CONTROL	X	X		
CM_CALL_STATUS			X	

Shown in 2 is the GCCI interface.

The generalized call control interface (GCCI) is an asynchronous interface which allows PCMs to interface with CM/2′s switched network call control components, that is, Connection Manager and CNM Manager. The PCM modules, the Connection Manager, and CNM Manager issue GCCI primitives to one another to provide and request services. There are four types of GCCI primitives:

Request	Issued by the Connection Manager and the CNM Manager to invoke a service or function from a PCM.
Confirm	Issued by the PCM to confirm receipt of a request request.
Indication	Issued by the PCM to inform the service user of an asynchronous event.
Response	Issued by the service user. Upon completion of an action, they may become indication primitives.

Table 8 lists the GCCI primitives. If you need further information about the GCCI primitives, refer to *ISDN Port Connection Manager (PCM) Programming Reference*

Table 8. GCCI Primitives

Primitive Name	REQUEST	CONFIRM	INDICATION	RESPONSE
CM_ACTIVATE_SAP	X	X		
CM_DEACTIVATE_SAP	X	X	X	
CM_CALL_SETUP	X	X	X	X
CM_CALL_CLEAR	X	X	X	X
CM_CALL_CONNECTED			X	
CM_CALL_CONTROL	X	X		
CM_CALL_STATUS			X	

Shown in 3 is the Switched Connection Path Interface (SCPI) which is used by the PCMs to communicate with the MACs through a set of SCPI primitives. Since there are no CM/2 product publication available yet that we can refer you to for additional information, here is a very brief description of some of these primitives so that you can recognize them in a trace.

Register_PCM	Issued to exchange entry point addresses between the PCM and the MAC when the PCM needs to establish communications with the MAC.
Release_PCM	Releases the PCM′s ownership of the port.
Get_PPAT_Parms	Issued to get MAC′s PPAT values.
Set_PPAT_Parms	Issued to reset MAC′s PPAT values.
Activate_Mode	Set the MAC to COMMAND or PROTOCOL mode.

Note

If in CONNECT mode: initializing modem, dialing phone number, and activating (deactivating) physical connection all occur through SCPI interface. If in PROTOCOL mode: logical links are activated and deactivated, and the frames are transmitted through the NDIS interface.

Activate_Phys_Conn	Issued to raise DTR and RTS, thereby activating a physical connection.
Deactivate_Phys_Conn	Issued to drop DTR and RTS, and therefore drop the connection.
TransmitImmediateData	Used for sending data to the modem, such as initialization and dialing strings.

The following primitives are issued to the PCM by the MAC:

ReceiveImmediateData	Informs a PCM that a MAC has received data to be processed by the PCM. At this time, DSR and CD are set.
Connection_Active	An indication from the MAC to the PCM that a physical connection has been established.
Connection_Inactive	Notifies the PCM that the physical connection has gone inactive.
PortMgmt_Request_Complete	Indicates that the previous port management request has been completed.

As shown in 4 , if the MAC is in PROTOCOL mode, the following primitives are issued through the NDIS interface between the protocol driver and the MAC. These are the primitives issued to MAC by protocol driver:

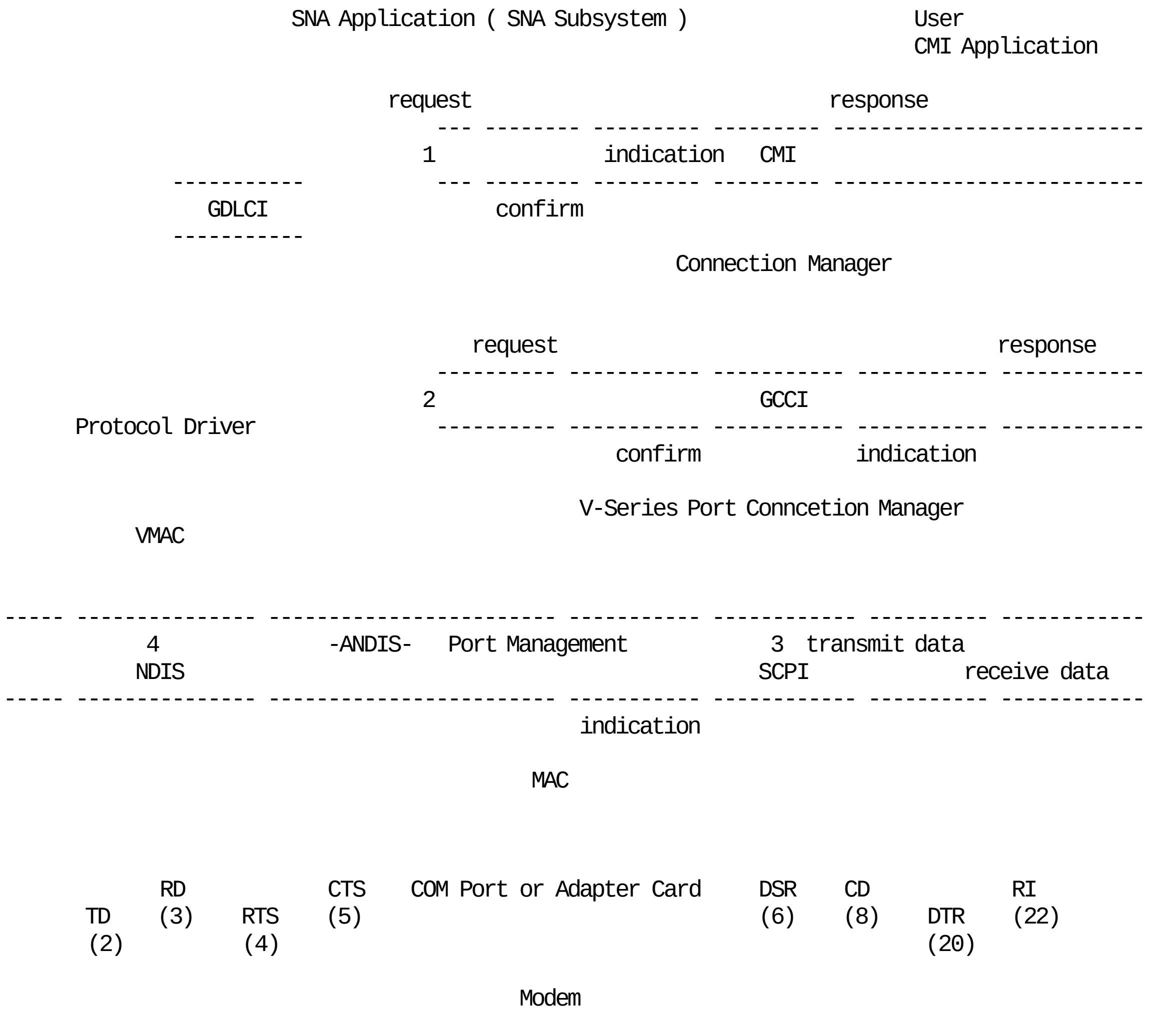
Bind	MAC and protocol driver exchange Common Characteristic Table (CCT) information, which means communication can start.
Unbind	Issued to unbind from the MAC. As a result, this allows the MAC to be bound by another protocol driver.
OpenAdapter	Issued to activate a physical device′s network connection.
CloseAdapter	Issued to close the physical device so that no more data can be sent or received.
TransmitChain	Issued to initiate the transmission of a frame by asking MAC to transmit data. The protocol driver hands over the ownership of the frame transfer to the MAC.

ReceiveRelease Issued to return frame storage to the MAC after receiving a frame.

The following primitives are issued to the protocol driver by MAC:

TransmitConfirm Issued to indicate completion of frame transmission. Ownership of the frame storage returns to the protocol driver.

ReceiveChain Issued to indicate reception of a frame. The MAC hands over ownership of the frame transfer to the protocol driver.



Numbers in parentheses denote the RS-232 pin numbers which carry the given signal.
Signals depicted with an up-arrow are controlled by the modem.
Signals depicted with a down-arrows are controlled by the Terminal.

Figure 157. Primitive Flows between Each Interface

13.2.2 Sample Trace of CM/2 Startup

There are many events taking place at CM/2 start time in order to get all the SNA Phone Connect components loaded and operational, as we have seen previously from some of the flows in the previous chapter.

If you need to see these events in a trace, then you can select the SNAPHONE ME TRACE trace point under Events, which will capture the events related to the Module Enabler′s activities.

Note

Note that some events, especially at the beginning, might not appear in the trace if these events occur before the CNM Manager has had a chance to register the trace points with the module enabler.

The following sample trace, taken at CM/2 start time, corresponds to the flows illustrated in Figure 145 on page 190, so the numbers highlighted X also correspond to the numbers in Figure 145 on page 190. Note that we have annotated the trace in some places with arrows and comments, and that we have marked omitted records with ′...........′.

```
TRACE COPIED  8/29/1994 11:44:08.03


INTERNALS     Switched Network   SN_MER             TRACE         11:43:40.75
0870f0e5  Starting the ME DLL                                   Component name
                                                                             (Module Enabler)


INTERNALS     Switched Network   SN_MER             TRACE         11:43:40.75
0870f1f0  Starting the ME EXE

  .......................................

INTERNALS     Switched Network   SN_MER             TRACE         11:43:41.88
087300b9  ME INI parsing Routine. 0=init 1=dyn

    0000                                    <..              >
                                                                               Return code
INTERNALS     Switched Network   SN_MER             TRACE         11:43:41.88
087300cb  ME INI parsing NETWORK.INI file                                    Reading/processing
                                                                             NETWORK.INI
                                                                                1
INTERNALS     Switched Network   SN_MER             TRACE         11:43:42.00
087301f6  ME: Found an ISDN PCM

    0000                                    <..              >

INTERNALS     Switched Network   SN_MER             TRACE         11:43:42.13
087101ec  ME parsing Network.INI. RC =

    0000                                    <..              >

INTERNALS     Switched Network   SN_MER             TRACE         11:43:42.16
087101f2  Number of PCMs read from Network.INI.

    6700                                    <g.              >
                                                                               Return code indicates
INTERNALS     Switched Network   SN_MER             TRACE         11:43:42.16  number of PCMs found
087101fb  ME: ISDN/REMOTELAN PCM information               (0067 hex= 103 PCMs)

    41435356 5350434D 00535441 52545650     <ACSVSPCM.STARTVP>             Entry point
    434D0000 00000000 00000000 00000000     <CM... ..........>
    00000000 00000000 00000000 00000000     <.....                         DLL
    00000000 00000000 00000000 00000000     <................>
    00000000 00000000 004E4F00 00010000     <.........NO.                  AUTOSTART=NO
    xxxxxxxxxxxxxxxxxxxxx

    ............... For each PCM in the NETWORK.INI .................

INTERNALS     Switched Network   SN_MER             TRACE         11:43:42.19
087101fb  ME: ISDN/REMOTELAN PCM information

    41435356 5350434D 00535441 52545650     <ACSVSPCM.STARTVP>
    434D0000 00000000 00000000 00000000     <CM..............>
    00000000 00000000 00000000 00000000     <................>
    00000000 00000000 00000000 00000000     <................>
    00000000 00000000 00594553 0001001A     <.........YES.                AUTOSTART=YES
    xxxxxxxxxxxxxxxxxxxxx

    ................

INTERNALS     Switched Network   SN_MER             TRACE         11:43:42.28
08710227  Initializing ME with CNM_INIT. PCM Sap structure =

    B43F0F00 57434C5F 4D455200 00000000     <.?..WCL_MER.                 PCM name passed
    00000000 0100                           <......          >            to CNM manager
```

Figure 158. Sample CM/2 Starting Trace (1 of 6)

```
API REQUEST   Switched Network    SN_MER           TRACE          11:43:44.94
0870508f  ME Activate Sap entry point calledActivate SAP

    22000D0C 14002000 00000000 00000101      <†..... .........>
    00085743 4C5F4D45 52000000 00000000      <..WCL_MER.......>
    0000                                     <..              >

API RETURN    Switched Network    SN_MER           TRACE          11:43:44.94
087050e8  ME Sending PCM_ACTIVATE_SAP.confirm

    2C000DCC 20002003 00000101 00000000      <,... . .........>
    XXXXXXXXXXXXXXXXXXXXX

INTERNALS     Switched Network    SN_MER           TRACE          11:43:44.94
087050f2  Return code from ME PCM_ACTIVATE_SAP.confirm

    0000                                     <..              >

INTERNALS     Switched Network    SN_MER           TRACE          11:43:44.94
08710235  Returned from CNM_INIT. Return code =

    0000                                     <..              >

INTERNALS     Switched Network    SN_MER           TRACE          11:43:44.94
0871024f  Initializing ME with CMI_INIT_RAS. PCM Sap structure
=
    B43F0F00 00000000 00000000 00000000      <.?..............>
    00000000 0100                            <......          >

INTERNALS     Switched Network    SN_MER           TRACE          11:43:45.53
0871025c  Returned from CMI_INIT_RAS. Return code =

    0000                                     <..              >

INTERNALS     Switched Network    SN_MER           TRACE          11:43:45.56
08710262  Calling CMI_INIT_RAS Complete. PCM Sap structure =

    CA6007AF 43584D00 00000000 00000000      <.-..CXM.........>
    00000000 0100                            <......          >

 ..................................................

INTERNALS     Switched Network    SN_MER           TRACE          11:43:45.56
087104d0  ME START PCM routine


INTERNALS     Switched Network    SN_MER           TRACE          11:43:45.72
08710520  Got the Proc Address for the PCM               2

    41435356 5350434D 00535441 52545650      <ACSVSPCM.STARTVP>
    434D0000 00000000 00000000 00000000      <CM..............>
    00000000 00000000 00000000 00000000      <................>
    00000000 00000000 00000000 00000000      <................>
    00000000 00000000 00594553 0001001A      <.........YES....>
    XXXXXXXXXXXXXXXXXXXXX

API REQUEST   Switched Network    SN_MER           TRACE          11:43:45.72
0871057c  Calling the PCM init address routine

    DC200F00 00000100 18986F00 00000000      <. .......qo.....>
    00000000 00000000 00000000 00000000      <................>
    00000000 00000000 00000000 00000000      <................>

API REQUEST   Switched Network    SN_MER           TRACE          11:43:46.00
0870207f  A PCM is calling the ME. This is the control block         A PCM (IBM5853) is
                                                                       calling ME
    2000010F 00000000 00000000 49424D35      < ...........IBM5>
    38353300 0C06AF00 9A200100 D24C7713      <853...... ..KLw.>
    6A00                                     <j.              >
```

Figure 159. Sample CM/2 Starting Trace (2 of 6)

```
API REQUEST   Switched Network   SN_MER            TRACE          11:43:46.00
087200bf  A PCM has made a GET_CONGIG request.          The PCM wants its
                                                                            config data
    2000010F 00000000 00000000 49424D35     < ...........IBM5>
    38353300 0C06AF00 9A200100 D24C7713     <853...... ..KLw.>

INTERNALS     Switched Network   SN_MER            TRACE          11:43:46.00
0870408f  ME getting procotol path routine.


INTERNALS     Switched Network   SN_MER            TRACE          11:43:46.06
0870420f  merprotp - protocol.ini path name

    443A5C49 424D434F 4D5C5052 4F544F43     <D:\IBMCOM\PROTOC>
    4F4C2E49 4E490000 00000000 00000000     <OL.INI.                          Getting PROTOCOL.INI
    00000000 00000000 00000000 00000000     <................>                file path
    xxxxxxxxxxxxxxxxxxxxx

API RETURN    Switched Network   SN_MER            TRACE          11:43:46.22
087203be  PCM GET_CONGIG request processed, rc =

    0000                                    <..              >

API RETURN    Switched Network   SN_MER            TRACE          11:43:46.22
087203c6  PCM¢s config data is -

    2600BF00 00000000 4449414C 4F475459     <&.......DIALOGTY>                Returning config data
    50450000 00000000 01000A00 4154434D     <PE..........ATCM>                 3
    442E4444 46004F00 BF000000 BF005359     <D.DDF.O.......SY>
    4E434852 4F4E4943 49545900 00000100     <NCHRONICITY.....>
    0D004173 796E6368 726F6E6F 75730070     <..Asynchronous.p>
    00BF0026 00BF0050 4F52544E 414D4500     <...&...PORTNAME.>
    00000000 00000001 00050043 4F4D3100     <...........COM1.>
    8F00BF00 4F00BF00 41434350 54494E43     <....O...ACCPTINC>
    43414C4C 00000000 01000300 4E4F00B7     <CALL........NO..>
    00BF0070 00BF004D 4F44454D 434C4153     <...p...MODEMCLAS>
    53000000 00000001 000C0055 6E737065     <S..........Unspe>
    63696669 656400D8 00BF008F 00BF0053     <cified.Q.......S>
    45524941 4C504F52 54535045 45440001     <ERIALPORTSPEED..>
    00050032 34303000 F800BF00 B700BF00     <...2400.8.......>
    4155544F 42415544 44455445 43540000     <AUTOBAUDDETECT..>
    01000400 4F666600 1C01BF00 D800BF00     <....Off.....Q...>
    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxxxxxxxxxx
    BF004E4F 414E5357 45520000 00000000     <..NOANSWER......>
    00000100 10004E4F 20414E53 5745525C     <......NO ANSWER\>
    43525C4C 4600FE03 BF00AA03 BF00564F     <CR\LF.........VO>
    49434500 00000000                       <ICE.....        >

API REQUEST   Switched Network   SN_MER            TRACE          11:43:47.03
0870207f  A PCM is calling the ME. This is the control block

    2200020F 00000000 00000000 49424D35     <†...........IBM5>
    38353300 6A00B7AE 01001900 143697AF     <853.j........6p.>
    0000                                    <..              >

INTERNALS     Switched Network   SN_MER            TRACE          11:43:47.03
087020e1  A New PCM is registering.              PCM registering
                                                                             5
    49424D35 38353300 6A00B7AE 01001900     <IBM5853.j.......>

INTERNALS     Switched Network   SN_MER            TRACE          11:43:47.03
0870211e  Added/Updated PCM active sap list of the ME.          PCM added to active
                                                                            list
    143697AF 49424D35 38353300 6A00B7AE     <.6p.IBM5853.j...>
    01001900 0100                           <......          >
```

Figure 160. Sample CM/2 Starting Trace (3 of 6)

```
API RETURN    Switched Network   SN_MER            TRACE          11:43:47.03
08710586  Return from calling the PCM init address routine

    0000                                    <..              >

INTERNALS     Switched Network   SN_MER            TRACE          11:43:47.03
087105ad  Setting PCM State to started

    41435356 5350434D 00535441 52545650     <ACSVSPCM.STARTVP>
    434D0000 00000000 00000000 00000000     <CM..............>
    00000000 00000000 00000000 00000000     <................>
    00000000 00000000 00000000 00000000     <................>
    00000000 00000000 00594553 0001001A     <.........YES....>
    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    xxxxxxxxxxxxxxxxxxxx
    00000000 00000000 00000000 00000000     <................>
    00                                      <.               >

INTERNALS     Switched Network   SN_MER            TRACE          11:43:47.03
087105fe  Calling CNM_INIT to register PCMS

    CA6007AF 43584D00 00000000 00000000     <.-..CXM.........>
    00000000 01001436 97AF4942 4D353835     <.......6p.IBM585>
    33006A00 B7AE0100 19000100              <3.j.........    >

  ................................................

INTERNALS     Switched Network   SN_MER            TRACE          11:43:49.72
0871061b  Return from calling CNM_INIT to register PCMS

    0000                                    <..              >

INTERNALS     Switched Network   SN_MER            TRACE          11:43:49.72
08710646  Calling CMI_INIT_PCM to register PCMS

    CA6007AF 43584D00 00000000 00000000     <.-..CXM.........>
    00000000 01001436 97AF4942 4D353835     <.......6p.IBM585>
    33006A00 B7AE0100 19000100              <3.j.........    >

INTERNALS     Switched Network   SN_MER            TRACE          11:43:49.72
08710660  Return from calling CMI_INIT_PCM to register PCMS

    0000                                    <..              >

INTERNALS     Switched Network   SN_MER            TRACE          11:43:49.75
087102c4  ME waiting for work to do. Going to sleep.                        ME has finshed its work


CCI REQUEST   Switched Network   CXM  GCCI           11:43:49.75
GCCI ACT SAP     0046 0006 b2d7:c610                                           8
    22000D0C 14002000 00000000 C0C4D7B2     <†..... ......DP.>
    00104942 4D353835 33000000 00000000     <..IBM5853.......>
    00001400 0401C22B FFAEC22B FFAE0000     <......B+..B+....>
    00000000 0000                           <......          >


INTERNALS     Switched Network   SN_MER            TRACE          11:43:49.75
0870f24a  ME EXE cleared DLL¢s RAM Semaphore


CCI CONFIRM   Switched Network   IBM5853  GCCI   11:43:51.44
Action Confirm
    200030CE 00002003 00000301 00120000     < .0... .........>
    00120000 00000000 00000000 00000000     <................>


API INDICATE  Switched Network   IBM5853  SCPI   11:43:52.85
Port Management Request Complete
    24000100 D81BAB0C 00001000 00000000     <$...Q...........>
```

Figure 161. Sample CM/2 Starting Trace (4 of 6)

```
DIALOG        Switched Network    IBM5853  DIALOG   11:43:52.85
EnterDialog InitNoInc

DIALOG        Switched Network    IBM5853  DIALOG   11:43:52.85
DoActions

DIALOG        Switched Network    IBM5853  DIALOG   11:43:52.85
Action : StartTimer

DIALOG        Switched Network    IBM5853  DIALOG   11:43:52.85
Action : WaitForResponse

DIALOG        Switched Network    IBM5853  DIALOG   11:43:52.88
DoResponses

EVENT         Switched Network    IBM5853  EVENT   11:43:52.88
State : Waiting for Dialog Response

CCI INDICATE  Switched Network    IBM5853  GCCI   11:43:54.06
Timeout
    0C00FFFF 00000002 D81BAB0C               <........Q...    >

EVENT         Switched Network    IBM5853  EVENT   11:43:54.06
Timed out waiting for Dialog Response

 ..........................................

API REQUEST   Switched Network    IBM5853  SCPI   11:43:54.10
Transmit Immediate Data                                                     11
    30000100 D81BAB0C 00000400 B619AB0C      <0...Q..........>
    4154490D                                 <ATI.           >

API RETURN    Switched Network    IBM5853  SCPI   11:43:54.10
Transmit Immediate Data
    30000100 D81BAB0C 00000400 B619AB0C      <0...Q..........>
    4154490D                                 <ATI.           >

 ....................................................

API INDICATE  Switched Network    IBM5853  SCPI   11:43:54.16
Receive Immediate Data
    50000000 D81BAB0C 00000400 B804AB0C      <P...Q..........>
    4154490D                                 <ATI.           >

 ....................................................

API INDICATE  Switched Network    IBM5853  SCPI   11:43:54.44
Receive Immediate Data
    50000000 D81BAB0C 00000800 B404AB0C      <P...Q..........>
    0D0A3132 330D0A0D                        <..123...       >

 ....................................................

API INDICATE  Switched Network    IBM5853  SCPI   11:43:54.47
Receive Immediate Data
    50000000 D81BAB0C 00000500 5004AB0C      <P...Q.......P...>
    0A4F4B0D 0A                              <.OK..          >

 ....................................................

API REQUEST   Switched Network    IBM5853  SCPI   11:43:54.81
Transmit Immediate Data
    30000100 D81BAB0C 00001500 7E17AB0C      <0...Q.......=...>
    41544331 45314631 4D315130 56315831      <ATC1E1F1M1Q0V1X1>
    53303D30 0D                              <S0=0.          >
```

Figure 162. Sample CM/2 Starting Trace (5 of 6)

```
API RETURN    Switched Network    IBM5853  SCPI   11:43:54.94
Transmit Immediate Data
    30000100 D81BAB0C 00001500 7E17AB0C      <0...Q.......=...>
    41544331 45314631 4D315130 56315831      <ATC1E1F1M1Q0V1X1>
    53303D30 0D                              <S0=0.           >

 ....................................................

API INDICATE  Switched Network    IBM5853  SCPI   11:43:55.10
Receive Immediate Data
    50000000 D81BAB0C 00000800 BC03AB0C      <P...Q...........>
    41544331 45314631                        <ATC1E1F1        >

 .....................................................


API INDICATE  Switched Network    IBM5853  SCPI   11:43:55.53
Receive Immediate Data
    50000000 D81BAB0C 00000600 BC04AB0C      <P...Q...........>
    0D0A4F4B 0D0A                            <..OK.                            12

 .....................................................

CCI CONFIRM   Switched Network    IBM5853  GCCI   11:43:55.56
Activate SAP Confirm
    2C000DCC 47002003 C0C4D7B2 00120000      <,...G. ..DP.....>
    00120000 00000000 CB02AB0C 00000000      <................>
    00000000 00000000 00000000 33000401      <............3...>
    02010100 4810D80F 00000000 00000000      <....H.Q.........>
    00000000 00000000 00000000 00000000      <................>
    00000000 00000000 01000000 00000014      <................>
    00040214 3697AF14 3697AF14 3697AF14      <....6p..6p..6p..>
    3697AF                                   <6p.             >

CCI CONFIRM   Switched Network    CXM  GCCI          11:43:55.56
GCCI ACT SAP       0046 0004 0cab:0440
    2C000DCC 47002003 C0C4D7B2 00120000      <,...G. ..DP.....>
    00120000 00000000 CB02AB0C 00000000      <................>
    00000000 00000000 00000000 33000401      <............3...>
    02010100 4810D80F 00000000 00000000      <....H.Q.........>
    00000000 00000000 00000000 00000000      <................>
    00000000 00000000 01000000 00000014      <................>
    00040214 3697AF14 3697AF14 3697AF14      <....6p..6p..6p..>
    3697AF                                   <6p.             >

CCI REQUEST   Switched Network    CXM  CMI           11:43:56.94
CMI ACT SAP       0048 0001 9a7f:b146                                      13
    22000D0F 00000000 00000000 00000000      <†...............>
    00000000 0000A020 00000000 00000000      <....... ........>
    0000                                     <..              >

CCI CONFIRM   Switched Network    CXM  CMI           11:43:58.63
CMI ACT SAP       0048 0005 b2d7:c790
    2C000DCF 47000003 00000000 00100000      <,...G...........>
    00100000 00000000 C0C6D7B2 00000000      <.........FP.....>
    00000000 00000000 00000000 47000401      <............G...>
    49424D35 38353300 00000000 00000000      <IBM5853.........>
    02020001 01000000 4810D80F 00000000      <........H.Q.....>
    00000000 00000000 00000000 00000000      <................>
    00000000 00000000 00000000 01000000      <................>
    000000                                   <...             >
```

Figure 163. Sample CM/2 Starting Trace (6 of 6)

13.2.3 Sample Trace of an Outgoing Call

The following sample trace was taken when the 3270 emulator was started and an outgoing call was made. Figure 164 shows the configuration of this environment.

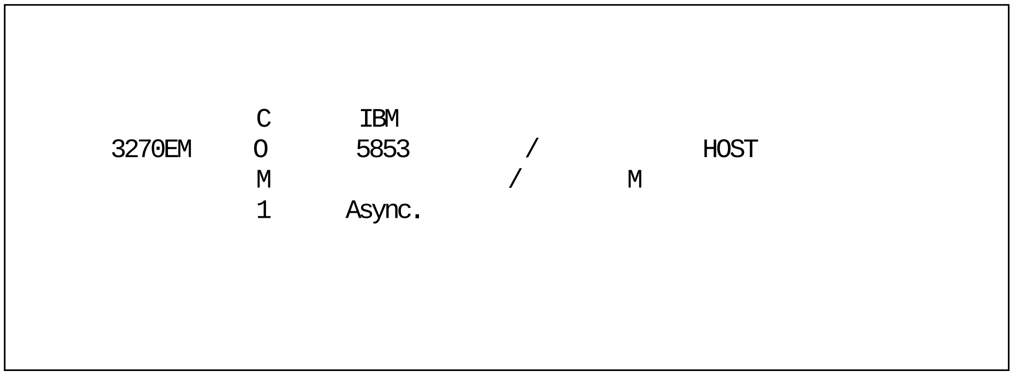


Figure 164. Sample Configuration

This sample trace corresponds to the flows illustrated in Figure 150 on page 195, so, the numbers highlighted X correspond to the numbers in Figure 150 on page 195. Note that we have included some arrows and comments to explain some events and have marked omitted records with ′............′.

```
TRACE COPIED  8/29/1994 17:22:11.60
                                                                         Interface

CCI REQUEST   Switched Network    CXM  CMI           17:20:22.35
CMI CALL ESTAB   0048 0002 9a7f:a45e                                      2
    1000100F 48000004 C0C6D7B2 6AB17F9A      <....H....FP.j.†.>
    480004FF 33323730 47575F32 00000000      <H...3270GW_2....>
    00000000 00000000 00000000 00000000      <....... ........>
    00000000 00040000 00000000 00000000      <.......                    Outgoing call directory
    00000000 00000000 00000000 00000000      <................>          entry name
    00000000 00000000                        <........       >

CCI REQUEST   Switched Network    CXM  GCCI          17:20:24.91
GCCI CALL SETUP  0046 0006 b2d7:e820                                      3
    1000100C 1C002004 CB02AB0C B0ECD7B2      <...... .......P.>
    10008004 FFFF0000 00000100 04000101      <................>
    0C008070 00000531 32343330               <...p...12430               Called party number

CCI REQUEST   Switched Network    IBM5853  GCCI   17:20:24.91
Call Setup Request
    1000100C 1C002004 CB02AB0C B0ECD7B2      <...... .......P.>
    10008004 FFFF0000 00000100 04000101      <................>
    0C008070 00000531 32343330               <...p...12430   >

EVENT         Switched Network    IBM5853  EVENT   17:20:24.91
Entered ProcessCalledNum

CCI CONFIRM   Switched Network    IBM5853  GCCI   17:20:24.91
Call Setup Confirm
    1C0010CC 1E002001 B0ECD7B2 00120000      <...... ...P.....>
    00120000 00000000 D81BAB0C 18008018      <........Q.......>
    01000001 4810D80F 01000000 00000000      <....H.Q.........>
    00000000 06008201 0100                   <......b...     >

CCI CONFIRM   Switched Network    CXM  GCCI          17:20:24.94
GCCI CALL SETUP  0046 0004 0cab:0508
    1C0010CC 1E002001 B0ECD7B2 00120000      <...... ...P.....>
    00120000 00000000 D81BAB0C 18008018      <........Q.......>
    01000001 4810D80F 01000000 00000000      <....H.Q.........>
    00000000 06008201 0100                   <......b...     >

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94
EnterDialog Originate

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94
DoActions

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94
Action : SendDialCommandDIALPREFIX

API REQUEST   Switched Network    IBM5853  SCPI   17:20:24.94
Transmit Immediate Data                                                   4
    30000100 D81BAB0C 00000900 AE1E8F00      <0...Q...........>
    41544454 31323433 30                     <ATDT12430                  Phone number with AT command

API RETURN    Switched Network    IBM5853  SCPI   17:20:24.94
Transmit Immediate Data
    30000100 D81BAB0C 00000900 AE1E8F00      <0...Q...........>
    41544454 31323433 30                     <ATDT12430      >

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94
Action : SendString DIALSUFFIX

API REQUEST   Switched Network    IBM5853  SCPI   17:20:24.94
Transmit Immediate Data
    30000100 D81BAB0C 00000100 4615AB0C      <0...Q.......F...>
    0D                                       <.              >
```

Figure 165. Sample Outgoing Call Trace (1 of 6)

```
API RETURN    Switched Network    IBM5853  SCPI   17:20:24.94
Transmit Immediate Data
    30000100 D81BAB0C 00000100 4615AB0C      <0...Q.......F...>
    0D                                       <.               >

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94     The PCM is looking for the string
Action : StartTimer                                                                 correspondig to these string sent
                                                                                    from the modem.
DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94
Action : WaitForResponse                                                            If the PCM gets string from
                                                                                    the modem, it sends indication
DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94     primitive to the CXM.
DoResponses

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94
Response : ReceiveString CONNECTPREFIX

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94
Response : ReceiveString RINGBACK

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.94
Response : ReceiveString FAILURE

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.97
Response : ReceiveString BUSY

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.97
Response : ReceiveString NOCARRIER

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.97
Response : ReceiveString NODIALTONE

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.97
Response : ReceiveString NOANSWER

DIALOG        Switched Network    IBM5853  DIALOG   17:20:24.97
Response : ReceiveString VOICE

EVENT         Switched Network    IBM5853  EVENT   17:20:24.97
State : Waiting for Dialog Response

CCI CONFIRM   Switched Network    CXM  CMI            17:20:24.97
CMI CALL ESTAB   0048 0005 b2d7:c790
    1C0010CF 43000001 6AB17F9A 00100000      <....C...j.†.....>
    00120000 00000000 B0ECD7B2 250004FF      <..........P.%...>
    00000000 00000000 00000000 00000000      <................>
    49424D35 38353300 00000000 00000000      <IBM5853.........>
    02180080 18010000 014810D8 0F010000      <.........H.Q....>
    00000000 00000000 00060082 010100        <...........b... >

API INDICATE  Switched Network    IBM5853  SCPI   17:20:24.97
Receive Immediate Data
    50000000 D81BAB0C 00000800 F004AB0C      <P...Q.......0...>
    41544454 31323433                        <ATDT1243                  This is echo from the modem

  ....................................................

CCI INDICATE  Switched Network    IBM5853  GCCI   17:20:25.00
Call Status Indicate
    1800144C 13002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000D00      <..........b.....>
    80280841 54445431 323433                 <.(.ATDT1243     >

CCI INDICATE  Switched Network    CXM  CMI            17:20:25.00
CMI CALL ESTAB   0045 0003 b2d7:c810
    1000104F 2A000001 00000000 B0ECD7B2      <...O*.........P.>
    2A0004FE 0249424D 35383533 00000000      <*....IBM5853....>
    00000000 00333237 3047575F 32000000      <.....3270GW_2...>
    00000000 00010000 0000                   <..........      >
```

Figure 166. Sample Outgoing Call Trace (2 of 6)

```
CCI INDICATE  Switched Network    CXM  GCCI           17:20:25.00
GCCI CALL STATUS 0046 0004 0cab:04bc
    1800144C 13002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000D00      <.........b.....>
    80280841 54445431 323433                 <.(.ATDT1243     >

EVENT         Switched Network    IBM5853  EVENT   17:20:25.00
State : Waiting for Dialog Response

API INDICATE  Switched Network    IBM5853  SCPI   17:20:25.00
Receive Immediate Data
    50000000 D81BAB0C 00000200 9804AB0C      <P...Q.......q...>
    300D                                     <0.                               This is echo from the modem
                                                                               (continued)
 ..................................................                            It is ¢ATDT12430¢.

CCI INDICATE  Switched Network    IBM5853  GCCI   17:20:25.03
Call Status Indicate
    1800144C 0D002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000700      <.........b.....>
    80280230 0D                              <.(.0.          >

CCI INDICATE  Switched Network    CXM  GCCI           17:20:25.03
GCCI CALL STATUS 0046 0004 0cab:046c
    1800144C 0D002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000700      <.........b.....>
    80280230 0D                              <.(.0.          >

EVENT         Switched Network    IBM5853  EVENT   17:20:25.03
State : Waiting for Dialog Response

CCI INDICATE  Switched Network    CXM  CMI            17:20:25.03
CMI CALL STATUS  0048 0005 b2d7:c790
    0C00144F 13000001 6AB17F9A 06008201      <...O....j.†...b.>
    10000D00 80280841 54445431 323433        <.....(.ATDT1243

CCI INDICATE  Switched Network    CXM  CMI            17:20:25.03    The CXM send ¢ATDT1243¢ string
CMI CALL STATUS  0048 0005 b2d7:c870                                              to two CMI application.
    0C00144F 0D000001 6AB17F9A 06008201      <...O....j.†...b.>                   These are SNA subsystem and
    10000700 80280230 0D                     <.....(.0.      >                    Call Status Window application
                                                                                  CM/2 provides.
CCI INDICATE  Switched Network    CXM  CMI            17:20:25.06
CMI CALL STATUS  0045 0003 b2d7:7d0
    0C00144F 13000001 B0ECD7B2 06008201      <...O......P...b.>
    10000D00 80280841 54445431 323433        <.....(.ATDT1243

CCI INDICATE  Switched Network    CXM  CMI            17:20:25.06
CMI CALL STATUS  0045 0003 b2d7:c8b0
    0C00144F 0D000001 B0ECD7B2 06008201      <...O......P...b.>
    10000700 80280230 0D                     <.....(.0.      >

API INDICATE  Switched Network    IBM5853  SCPI   17:20:41.00
Receive Immediate Data
    50000000 D81BAB0C 00000800 F004AB0C      <P...Q.......0...>
    0D0A434F 4E4E4543                        <..CONNEC                         Phone line connected

 ................................................

CCI INDICATE  Switched Network    IBM5853  GCCI   17:20:41.00
Call Status Indicate
    1800144C 13002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000D00      <.........b.....>
    8028080D 0A434F4E 4E4543                 <.(...CONNEC     >

CCI INDICATE  Switched Network    CXM  GCCI           17:20:41.00
GCCI CALL STATUS 0046 0004 0cab:04bc
    1800144C 13002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000D00      <.........b.....>
    8028080D 0A434F4E 4E4543                 <.(...CONNEC     >
```

Figure 167. Sample Outgoing Call Trace (3 of 6)

```
EVENT         Switched Network    IBM5853  EVENT   17:20:41.03
State : Waiting for Dialog Response

CCI INDICATE  Switched Network    CXM  CMI           17:20:41.03
CMI CALL STATUS  0048 0005 b2d7:c790
    0C00144F 13000001 6AB17F9A 06008201      <...O....j.†...b.>
    10000D00 8028080D 0A434F4E 4E4543        <.....(...CONNEC >                You can see CONNECT status
                                                                               in Call Status Window
CCI INDICATE  Switched Network    CXM  CMI           17:20:41.03
CMI CALL STATUS  0045 0003 b2d7:7d0
    0C00144F 13000001 B0ECD7B2 06008201      <...O......P...b.>
    10000D00 8028080D 0A434F4E 4E4543        <.....(...CONNEC >

API INDICATE  Switched Network    IBM5853  SCPI   17:20:41.03
Receive Immediate Data
    50000000 D81BAB0C 00000800 F004AB0C      <P...Q.......0...>
    54203234 30300D0A                        <T 2400..        >

DIALOG        Switched Network    IBM5853  DIALOG   17:20:41.03
DoResponses

DIALOG        Switched Network    IBM5853  DIALOG   17:20:41.03
Response : ReceiveString CONNECTPREFIX

CCI INDICATE  Switched Network    IBM5853  GCCI   17:20:41.03
Call Status Indicate
    1800144C 0C002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000600      <..........b.....>
    80280154                                 <.(.T            >

CCI INDICATE  Switched Network    CXM  GCCI          17:20:41.03
GCCI CALL STATUS 0046 0004 0cab:04c4
    1800144C 0C002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000600      <..........b.....>
    80280154                                 <.(.T            >

DIALOG        Switched Network    IBM5853  DIALOG   17:20:41.03
Response has been found! CONNECTPREFIX

 ..............................................

CCI INDICATE  Switched Network    IBM5853  GCCI   17:20:41.06
Call Status Indicate
    1800144C 10002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000A00      <..........b.....>
    80280520 32343030                        <.(. 2400        >

CCI INDICATE  Switched Network    CXM  GCCI          17:20:41.06
GCCI CALL STATUS 0046 0004 0cab:04b4
    1800144C 10002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000A00      <..........b.....>
    80280520 32343030                        <.(. 2400        >

 ...............................................

CCI INDICATE  Switched Network    IBM5853  GCCI   17:20:41.06
Call Status Indicate
    1800144C 0D002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000700      <..........b.....>
    8028020D 0A                              <.(...           >

CCI INDICATE  Switched Network    CXM  GCCI          17:20:41.06
GCCI CALL STATUS 0046 0004 0cab:04b8
    1800144C 0D002001 B0ECD7B2 00120000      <...L.. ...P.....>
    00120000 00000000 06008201 10000700      <..........b.....>
    8028020D 0A                              <.(...           >
```

Figure 168. Sample Outgoing Call Trace (4 of 6)

```
DIALOG        Switched Network    IBM5853  DIALOG   17:20:41.06
Response has been found! CONNECTSUFFIX

 ..............................................

CCI INDICATE  Switched Network    CXM  CMI            17:20:41.06
CMI CALL STATUS  0048 0005 b2d7:c790
    0C00144F 0C000001 6AB17F9A 06008201      <...O....j.†...b.>
    10000600 80280154                        <.....(.T        >

CCI INDICATE  Switched Network    CXM  CMI            17:20:41.10
CMI CALL STATUS  0048 0005 b2d7:c848
    0C00144F 10000001 6AB17F9A 06008201      <...O....j.†...b.>
    10000A00 80280520 32343030               <.....(. 2400    >

 ..................................................

API INDICATE  Switched Network    IBM5853  SCPI   17:20:41.47
Connection Active                                                            5
    20000000 D81BAB0C 0000B000 004B0000      < ...Q........K..>             Physical Connection
                                                                            is now active
API REQUEST   Switched Network    IBM5853  SCPI   17:20:41.47
Get PPAT Parms
    04000100 D81BAB0C 00007800 D400AB0C      <....Q.....x.M...>

API RETURN    Switched Network    IBM5853  SCPI   17:20:41.47
Get PPAT Parms
    04000100 D81BAB0C 00007800 D400AB0C      <....Q.....x.M...>
    78000000 01000002 0300E80F 4810D80F      <x.........Y.H.Q.>
    434F4D31 00000000 00000000 00000000      <COM1............>
    52533233 32440000 00000000 00000000      <RS232D..........>
    5E09E00F 00000000 FC05E00F BE08E00F      < ...............>
    2E09E00F 00000000 004B0000 40000000      <.........K.. ...>
    01000000 00000000 00000000 B0000000      <................>
    00001100 60090000 60090000 0201020C      <....-...-.......>
    13110800 00000000                        <........        >

API REQUEST   Switched Network    IBM5853  SCPI   17:20:41.47
Set PPAT Parms
    05000100 D81BAB0C 00000000 D400AB0C      <....Q.......M...>
    78000000 01000002 0300E80F 4810D80F      <x.........Y.H.Q.>
    434F4D31 00000000 00000000 00000000      <COM1............>
    52533233 32440000 00000000 00000000      <RS232D..........>
    5E09E00F 00000000 FC05E00F BE08E00F      < ...............>
    2E09E00F 00000000 004B0000 40000000      <.........K.. ...>
    01000000 00000000 00000000 B0000000      <................>
    00001100 60090000 60090000 0201020C      <....-...-.......>
    13110800 00000000                        <........        >

API RETURN    Switched Network    IBM5853  SCPI   17:20:41.47
Set PPAT Parms
    05000100 D81BAB0C 00000000 D400AB0C      <....Q.......M...>

API REQUEST   Switched Network    IBM5853  SCPI   17:20:41.47
Activate Mode                                                                6
    02000100 D81BAB0C 00000100 00000000      <....Q...........>

API RETURN    Switched Network    IBM5853  SCPI   17:20:41.47
Activate Mode
    02000100 D81BAB0C 00000100 00000000      <....Q...........>
```

Figure 169. Sample Outgoing Call Trace (5 of 6)

```
EVENT         Switched Network    IBM5853  EVENT   17:20:41.47
State : Connected

CCI INDICATE  Switched Network    IBM5853  GCCI   17:20:41.47
Call Connected Indicate                                               7
    0C00124C 10002001 B0ECD7B2 10008004      <...L.. ...P.....>
    02FE6009 00000100 00000101               <..-.........   >

CCI INDICATE  Switched Network    CXM  GCCI          17:20:41.47
GCCI CALL CNTED  0046 0004 0cab:04f4
    0C00124C 10002001 B0ECD7B2 10008004      <...L.. ...P.....>
    02FE6009 00000100 00000101               <..-.........   >

CCI INDICATE  Switched Network    CXM  CMI           17:20:41.47
CMI CALL CNTED   0048 0005 b2d7:c790                                  9
    0C00124F 34000001 6AB17F9A 10008004      <...O4...j.†.....>
    02FE6009 00000100 00000101 18008018      <..-.............>
    01000001 4810D80F 01000000 00000000      <....H.Q.........>
    00000000 0C008070 00000531 32343330      <.......p...12430>

<==SEND=====  SDLC      #00               2EB37F9AB5FEE68E XID    17:20:41.50  10

CCI INDICATE  Switched Network    CXM  CMI           17:20:41.50
CMI CALL CNTED   0045 0003 b2d7:c8e8
    0C00124F 34000001 B0ECD7B2 10008004      <...O4.....P.....>
    02FE6009 00000100 00000101 18008018      <..-.............>
    01000001 4810D80F 01000000 00000000      <....H.Q.........>
    00000000 0C008070 00000531 32343330      <.......p...12430>

===RECV====>  SDLC      #00               2EB37F9AB5FEE68E XID    17:20:44.28

<==SEND=====  SDLC      #00               2EB37F9AB5FEE68E XID    17:20:44.28
    326105D0 00000000 8008C100 00000080      <2a........A.....>
    00010B30 00040900 01000007 000E0DF4      <...0...........4>
    E4E2C9C2 D4D9C14B E6E2F0F1 0E09F7C8      <USIBMRAKWS01..7H>
    XXXXXXXXXXXXXXXXXXXXX
```

Figure 170. Sample Outgoing Call Trace (6 of 6)

13.2.4 Sample Trace of a Failed Outgoing Call

When you start an application such as a 3270 emulator session for example, and this triggers a call to the remote host system, it might be that the establishment of the call fails, for some reason.

Following is an example of a trace taken for an unsuccessful attempt to connect to the host system because the remote modem is busy.

The configuration of this environment is the same as shown in Figure 164 on page 213. When the remote modem is busy, because it is already connected to another system for example, the local modem (in this case an IBM 5853) indicates this condition by returning a ′NO CARRIER′ indication to CM/2. We will see this ′NO CARRIER′ string flow from the modem to the PCM in the following trace.

Note that this particular modem (IBM 585) returns the string ′NO CARRIER′ when the remote modem is busy, switched off (out of order) or when the remote system does not answer. However, other type of modems may return the string ′BUSY′ to the PCM when the remote modem is busy. An example of this condition has been illustrated as well in Figure 173 on page 223.

```
TRACE COPIED  8/24/1994 11:57:53.34


CCI REQUEST   Switched Network    CXM  CMI           11:55:26.93
CMI CALL ESTAB   0042 0002 9cc7:a45e
    1000100F 48000004 588707B2 6AB1C79C      <....H...Xg..j.G.>
    480004FF 33323730 47575F32 00000000      <H...3270GW_2....>
    00000000 00000000 00000000 00000000      <................>
    00000000 00040000 00000000 00000000      <................>
    00000000 00000000 00000000 00000000      <................>
    00000000 00000000                        <........        >

CCI REQUEST   Switched Network    CXM  GCCI          11:55:29.09
GCCI CALL SETUP  0041 0006 b207:8b8
    1000100C 1C002004 AF01AB0C 48AD07B2      <...... .....H...>
    10008004 FFFF0000 00000100 04000101      <................>
    0C008070 00000533 32353136               <...p...32516    >

CCI REQUEST   Switched Network    IBM5853  GCCI   11:55:29.09
Call Setup Request
    1000100C 1C002004 AF01AB0C 48AD07B2      <...... .....H...>
    10008004 FFFF0000 00000100 04000101      <................>
    0C008070 00000533 32353136               <...p...32516    >

 ..................................................
 ..................................................


API INDICATE  Switched Network    IBM5853  SCPI   11:56:02.09
Receive Immediate Data
    50000000 701AAB0C 00000800 1804AB0C      <P...p...........>
    0D0A4E4F 20434152                        <..NO CAR

CCI INDICATE  Switched Network    IBM5853  GCCI   11:56:02.12
Call Status Indicate
    1800144C 13002001 48AD07B2 00120000      <...L.. .H.......>
    00120000 00000000 06008201 10000D00      <..........b.....>              Modem cannot set CD.
    8028080D 0A4E4F20 434152                 <.(...NO CAR     >              The remote modem may be
                                                                             busy or out of order or
CCI INDICATE  Switched Network    CXM  GCCI          11:56:02.12      the remote system cannot
GCCI CALL STATUS 0041 0004 0cab:03e4                                         answer.
    1800144C 13002001 48AD07B2 00120000      <...L.. .H.......>
    00120000 00000000 06008201 10000D00      <..........b.....>
    8028080D 0A4E4F20 434152                 <.(...NO CAR     >

EVENT         Switched Network    IBM5853  EVENT   11:56:02.12
State : Waiting for Dialog Response

CCI INDICATE  Switched Network    CXM  CMI           11:56:02.12
CMI CALL STATUS  0040 0003 b207:8868
    0C00144F 13000001 48AD07B2 06008201      <...O....H.....b.>
    10000D00 8028080D 0A4E4F20 434152        <.....(...NO CAR >

API INDICATE  Switched Network    IBM5853  SCPI   11:56:02.25
Receive Immediate Data
    50000000 701AAB0C 00000600 1C04AB0C      <P...p...........>
    52494552 0D0A                            <RIER.

 ................................................

CCI INDICATE  Switched Network    IBM5853  GCCI   11:56:02.25
Call Status Indicate
    1800144C 11002001 48AD07B2 00120000      <...L.. .H.......>
    00120000 00000000 06008201 10000B00      <..........b.....>
    80280652 4945520D 0A                     <.(.RIER..       >
```

Figure 171. Sample Outgoing Call Trace -Failure 1- (1 of 2)

```
CCI INDICATE  Switched Network    CXM  GCCI          11:56:02.25
GCCI CALL STATUS 0041 0004 0cab:03ec
    1800144C 11002001 48AD07B2 00120000      <...L.. .H.......>
    00120000 00000000 06008201 10000B00      <.........b.....>
    80280652 4945520D 0A                     <.(.RIER..       >

DIALOG        Switched Network    IBM5853  DIALOG   11:56:02.28
Response has been found! NOCARRIER

 ..............................................

CCI INDICATE  Switched Network    IBM5853  GCCI   11:56:02.28
Call Clear Indicate
    1C00114C 00002001 48AD07B2 08121234      <...L.. .H......4>
    00121234 00000000 701AAB0C               <...4....p...    >

CCI INDICATE  Switched Network    CXM  GCCI          11:56:02.28
GCCI CALL CLEAR  0041 0004 0cab:03f8
    1C00114C 00002001 48AD07B2 08121234      <...L.. .H......4>
    00121234 00000000 701AAB0C               <...4....p...    >

EVENT         Switched Network    IBM5853  EVENT   11:56:02.28
State : Waiting for Call Clear Response

CCI INDICATE  Switched Network    CXM  CMI           11:56:02.28
CMI CALL STATUS  0040 0003 b207:88e8
    0C00144F 11000001 48AD07B2 06008201      <...O....H.....b.>
    10000B00 80280652 4945520D 0A            <.....(.RIER.                You can see ¢NO CARRIER¢
                                                                         in the Call Status Window.
CCI INDICATE  Switched Network    CXM  CMI           11:56:02.46
CMI CALL CLEAR                                                            The application is informed that
    1C00114F 00000001 6AB1C79C 00101234      <...O....j.G....4>          the call is being cleared
    00121234 00000000 48AD07B2               <...4....H...    >

CCI INDICATE  Switched Network    CXM  CMI           11:56:02.46
CMI CALL CLEAR   0042 0005 b207:8928
    1C00114F 00000001 6AB1C79C 00101234      <...O....j.G....4>
    00121234 00000000 00000000               <...4........    >

CCI RESPONSE  Switched Network    CXM  CMI           11:56:02.53
CMI CALL CLEAR   0042 0002 9cc7:a4d0
    0C00118F 00000002 48AD07B2               <........H...    >

CCI RESPONSE  Switched Network    CXM  GCCI          11:56:02.53
GCCI CALL CLEAR  0041 0006 b207:8828
    0C00118C 00002002 701AAB0C               <...... .p...    >

CCI RESPONSE  Switched Network    IBM5853  GCCI   11:56:02.53
Call Clear Response
    0C00118C 00002002 701AAB0C               <...... .p...    >

 ...............................................

API REQUEST   Switched Network    IBM5853  SCPI   11:56:02.59
Deactivate Physical Connection
    08000100 701AAB0C 00000000 401F0000      <....p....... ...>

API RETURN    Switched Network    IBM5853  SCPI   11:56:02.59
Deactivate Physical Connection
    08000100 701AAB0C 00000000 401F0000      <....p....... ...>

 ................................................

API REQUEST   Switched Network    IBM5853  SCPI   11:56:04.28
Activate Physical Connection
    07000100 701AAB0C 00000000 E8030000      <....p.......Y...>

API RETURN    Switched Network    IBM5853  SCPI   11:56:04.28
Activate Physical Connection
    07000100 701AAB0C 02000000 E8030000      <....p.......Y...>
```

Figure 172. Sample Outgoing Call Trace -Failure 1- (2 of 2)

See the following trace. In this case, the IBM 5853 is not used. You can see that the modem is sending ′BUSY′ strings to the PCM in this trace. You will also find a status of ′BUSY′ in the Call Status window.

```
API INDICATE  Switched Network    ASYNCSW  SCPI   17:54:06.22
Receive Immediate Data
    50000000 3839AB0C 00000800 7821AB0C      <P...89......x!..>
    0D0A4255 53590D0A                        <..BUSY.                    The remote modem is busy
                                                                         because it has connection
DIALOG        Switched Network    ASYNCSW  DIALOG   17:54:06.22  with the other system.
DoResponses

DIALOG        Switched Network    ASYNCSW  DIALOG   17:54:06.22
Response : ReceiveString CONNECTPREFIX

DIALOG        Switched Network    ASYNCSW  DIALOG   17:54:06.22
Response : ReceiveString RINGBACK

DIALOG        Switched Network    ASYNCSW  DIALOG   17:54:06.22
Response : ReceiveString FAILURE

DIALOG        Switched Network    ASYNCSW  DIALOG   17:54:06.22
Response : ReceiveString BUSY

CCI INDICATE  Switched Network    ASYNCSW  GCCI   17:54:06.22
Call Status Indicate
    1800144C 13002001 20EADFB2 00120000      <...L.. . .......>
    00120000 00000000 06008201 10000D00      <..........b.....>
    8028080D 0A425553 590D0A                 <.(...BUSY..     >

CCI INDICATE  Switched Network    CXM  GCCI          17:54:06.22
GCCI CALL STATUS 001c 0004 0cab:2144
    1800144C 13002001 20EADFB2 00120000      <...L.. . .......>
    00120000 00000000 06008201 10000D00      <..........b.....>
    8028080D 0A425553 590D0A                 <.(...BUSY..     >

DIALOG        Switched Network    ASYNCSW  DIALOG   17:54:06.22
Response has been found! BUSY
```

Figure 173. Sample Outgoing Call Trace -Failure 2-

13.3 PD Hints and Tips

We have listed here, briefly, a few miscellaneous hints and tips regarding problem determination that are the result of our experiences. These might help you, in some cases, to more quickly identify a potential source of problems.

We have grouped these hints into the following five categories:

- SNA Phone Connect Checklist
- OS/2 Boot Errors
- CM/2 Start Errors
- Link Does Not Activate...
- Link Has Dropped...

13.3.1 SNA Phone Connect Checklist

Whenever you encounter any problem, you might want to go through this high level checklist first to ensure that none of these items has been overlooked:

- Has CM/2 V1.11 been completely reinstalled?
- Is OS/2 V2.x installed?
- Is LAPS WR07020 or higher installed?
- If using WAC, is the WAC MAC 2.x installed?
- Is the modem powered on?
- Is the phone line plugged into the correct modem jack?
- Is the cable plugged into the correct port?
- Is the appropriate port used for the connection type?
- Were any of the system files manually altered by anyone? (NETWORK.INI, PROTOCOL.INI, PIF files, NIF files)
- Are user-defined modem definitions used instead of the CM/2 supplied definitions?

13.3.2 OS/2 Boot Errors

A few events happen at OS/2 boot time which might have an incidence later on the SNA Phone Connect components.

- Boot error due to missing adapter

  If the user has a device statement in the CONFIG.SYS without the device installed or the adapter in the machine, there will be an error reported during IPL. These statements must be removed from CONFIG.SYS.

  For example, when you change the configuration of a machine and remove, say an MPA card for SNA Phone Connect, you then use CMSETUP to remove the PCM definition for the MPA adapter. However, there is still a MAC driver definition in the PROTOCOL.INI and an OS/2 device driver statement in CONFIG.SYS which have not been removed by the CMSETUP process. Consequently, when you reboot this error will occur and you will need to remove these statements by using the LAPS configuration process.

- DLC0083 message

  This message indicates that the MAC could not recognize the port name specified in the MAC configuration which is stored in PROTOCOL.INI.

- AT-bus WAC adapter IRQ conflict

  If the user has a WAC adapter on an AT-bus machine, the IRQ must not conflict with any other adapters in the machine such as token-ring adapters for example. See also 3.3, "Standard COM Port and IRQ Level Definition" on page 60 for information on IRQ levels.

  The slot number parameter references the I/O address of the card which is set by dip switches on the card. See the IBM WAC Installation and Testing Instructions Manual. For example:

```
DIP Switch = 1 1 0 1 1 1 0 ===> IRQ3 and slot #1

DIP Switch = 0 1 0 1 1 1 1 ===> IRQ4 and slot #0


        IRQ                 I/O address
1 = off = UP
0 = on = DOWN
```

Figure 174. DIP Switches Settings

13.3.3 CM/2 Start Errors

When CM/2 starts, there are many activities related to initializing all the SNA Phone Connect components. Some of the typical problems encountered during CM/2 startup are discussed here by looking at some of the messages that might be issued:

- PCM0001 and PCM0002

  These messages are usually accompanied by another PCM message, which may or may not pop up and display on the screen, so make sure you verify the message log by using the FFST Message Log Formatter.

- PCM0007 and PCM0008

  See user response in the message log and ensure LAPS WR07020 or higher is installed

- PCM0015

  A PCM failed to register itself with the MAC.

  - For async and autosync connections, check the IRQ and base address to ensure that there are no conflicts.
  - Are other applications using the same port?
  - Is the MAC properly installed and configured?

- PCM0016

  Cannot find the PPAT for the port configured in the PCM. Make sure that there is a MAC configuration for the port specified in the PCM. This is only a problem with WAC configuration because the MAC is defined through LAPS. For example, the user may have specified WAC0 in the LAPS configuration and used WAC_0 in the CM/2 PCM configuration.

- PCM0019

  The modem is not responding to the dial command. Make sure that the correct port is configured in PCM.

- PCM0021

  The modem is not responding to the initialization string sent by the PCM. Make sure that the modem is attached to the port defined in the PCM configuration. The initialization string that failed is logged in the FFST/2 error log as extra data.

- PCM0034

  The MAC failed to find the port specified in the PCM configuration. For example, for PCMCIA modems, the user didn′t install the modem device driver or configured for a port that didn′t exist. If the user is using a PCMCIA modem, make sure that the modem device driver is installed (or their equivalent such as PlayAtWill, or EasyPlay, or Plug+Play, etc.).

13.3.4 Link Does Not Activate

Here are a number of items that should be investigated if you can′t get a link to activate:

13.3.4.1 Hardware Configuration

- Use the correct level of the MPA adapter to be able to auto-dial on a synchronous connection. See 3.4, “Latest MPA Level” on page 60.
- If the user is using an MPA adapter, make sure to configure the adapter for synchronous operation using the reference diskette.
- On AT-bus machines, the MPA MAC only supports one adapter per machine.
- On Micro Channel machines, only two MPA adapters are supported, configured as SDLC. This is a card restriction only.
- The MPA MAC may require an additional flag inserted between successive frames by the partner workstation. For example, if using an MPA to call a WAC adapter, set the keyword ′FLAG′ in the WAC configuration to any number greater than 1.
- If using a WAC adapter, make sure to use the correct EIB (Electrical Interface Board) for the connection.
- If the connection stops working, try running the diagnostic program that comes with the WAC adapter to see if the adapter is defective.
- Don′t run with Kernel Debug. Kernel Debug defaults to COM2. If the machine only has one COM port, then Kernel Debug will default to COM1. Use KDB.INI to specify a different port for the Kernel Debug.

13.3.4.2 Modem and Cable Configuration

- Make sure that users use modem-defined characters in the Called Party Number subfield in Connection Manager profile. Check the modem reference manual to find the supported characters.
- If the modem has dip switches, make sure they are set correctly (read the modem reference manual carefully). Some examples are:
  - A dip switch can put the US Robotics Sportster in dump mode.
  - A dip switch can instruct the US Robotics Sportster to not accept incoming calls.
- If there are configuration options for the modem that can be configured from both dip switches and AT commands, which are sent by PCM, the dip switches take precedence.
- For a synchronous switched modem, make sure that the modem is configured to:
  - Drop both CD and DSR when the modem detects a loss of carrier or DTR drops. Many modems will prevent the MPA and WAC cards from detecting that an active connection has been lost. If this is not configured correctly, SDLC will timeout on its RRs after 80 seconds and the application will, as a result, clear the call.
  - Accept incoming calls (AutoAnswer).

- For synchronous connections, make sure that the modem supports V.25 Bit Oriented Protocol for auto-dial connections. Leased-line connections will work without the V.25bis support.
- For PCMCIA modems, make sure that the modem device driver is installed on the machine. If a modem device is not installed or if the modem does not come with a modem device driver, make sure that a software like PlayAtWill or EasyPlay is installed.
- If the user is using a modem eliminator for:
  - Synchronous (MPA) connection, make sure that clocking is provided for ′TxC′ and ′RxC′ signals on the physical connection. And also make sure that there is a delay (3.6 msecs) between RTS and CTS assertion.
  - Synchronous (WAC) connection, see the WAC reference manual and CM/2 What′s New reference.
  - Asynchronous connection, make sure that the NULL modem cable can be used for asynchronous leased lines (read the What′s New reference for specification).
- Use synchronous cable for synchronous connection. Most standard RS-232 cables can be used for synchronous modems. However, there are some cables that cannot be used because they may be missing ′TxC′ and ′RxC′ clock leads.
- Make sure that the modem cable is not defective. If using external modems, and the DTR is not raised, then the cable may be defective. For internal modems, use any asynchronous application to write to the port. If you cannot write to the port, then the cable may be defective or the cable may be plugged in on the wrong port, or the modem may be configured for synchronous, and so on.
- A modem does not support AutoSync if it does not support the AT command &Q4; however, even if it accepts &Q4, it still may not support AutoSync. An AutoSync modem must support HAYES AutoSync mode (proprietary to Hayes) in order to use the CM/2 AutoSync feature.
- R0CSDD.SYS must be loaded before MPADD.SYS. R0CSDD.SYS is used by the MPA synchronous device driver for CPU information.

13.3.4.3 CM/2 Configuration

- Verify the parameters which relate to other systems. For example:
  - When dialing into an AS/400 or the Advantis network, use AWP0224 as the Framing Standard. Framing Standard is configured in the Connection Manager profile. For OS/2, PC/3270 or NS/DOS, configure for ISO3309 Framing Standard.
  - If the user changed the CPNAME in CM/2 without changing the name in AS/400, then the link will not connect.
  - Once a connection to the Advantis Async Gateway is established, you can never change your node ID. For all subsequent connection attempts, you must always use the same node ID. The Async Gateway remembers the CPNAME/node ID pair.
  - If the user did not configure the line speed in the AS/400 CALC, then the serial port speed in CM/2 must match the line speed specified in the AS/400 configuration.
  - If the 5250 Logon fails, check the APPC sense code.

- For a workstation to accept incoming calls, the user must explicitly configure it to accept incoming calls. The configuration option is in the PCM profile and the SDLC DLC using SNA Phone Connections profile. The default is to NOT accept any incoming call.
- On the incoming call machine, if the call is momentarily connected and then the link is dropped, it may be that the incoming call directory entry is not defined to accept that particular type of call. For example:
  - If the user configured for a specific called party number in the incoming call directory entry. If the incoming call does not match any of the called party numbers in the directory entry, then the call will be rejected.
  - If the user configured for a modem connection type that does not match the one in the incoming call, then the call will be rejected.
- A virtual port is defined every time a new DLC profile is created. It is not associated with any physical adapter. This is why it is called a virtual port. A virtual port DLC can use multiple logical adapters, unlike a DLC which is configured for a physical port. One logical adapter is used for every logical link. A virtual port is associated with an incoming call directory entry if it is to accept incoming calls. Logical links (SNA Connections) are associated with outgoing call directory entries (or permanent connections) and point to a virtual port. In most configurations, you will only need one virtual port per type of DLC such as SDLC, IDLC, and so on.
- The encoding scheme specified in the PCM profile is used to communicate with the modem for initialization, call origination, and incoming call acceptance. The encoding scheme specified in the Connection Manager profile overrides the encoding scheme in the PCM profile. If the user selects **Use default**, SNA Phone Connect will use the encoding scheme configured in the PCM profile. It is recommended that the user configure the directory entry with ″Use Default″ unless there is a need to connect to two different synchronous modems where each requires a different encoding scheme.
- For leased-line connection, make sure:
  - That the serial port speed is set to the same value on both systems. The speed must match the ″DTE speed″ configured in both modems as well.
  - To use the correct phone line (2 wires or 4 wires).
  - That the Permanent Connection Name configured in PCM matches the Permanent Connection Name selected for the logical link.
- Serial Port speed may not be appropriate.
  - Async and AutoSync MACs can drive COM ports only so fast.
  - Other devices contending for CPU time for interrupt processing make the problem worse.
  - When the COM port is receiving data faster than the MACs can process the data:
    - Frames may be lost
    - Connection may not stay up
  - Example configurations where this problem is likely:
    - 38.4 Kbps serial port speed on two ports (COM1 and COM2) on a 386 system even with FIFO enabled.

    - 38.4 Kbps serial port speed, even on a fast system like a 486 CPU may be too high if the COM port is of type 1 (no FIFO).
    - MACs log message DLC0080 (FIFO enabled) or DLC0081 (FIFO disabled) at boot time.
  - Resolution is to specify a lower serial port speed.

13.3.5 Link Has Dropped

- If the user specified a value for the inactivity timer, then the link will be dropped after the specified time when there is no data traffic. If the user needs the link to stay up indefinitely, do not configure the inactivity timer. This option is located on the SDLC DLC using SNA Phone Connect profile.
- If ″Free unused link″ is configured in the DLC profile, the links using that DLC will drop:
  - As soon as the last LU-LU session ends (UNBIND received) when using dependent LUs (for example a 3270 session).
  - 10 seconds + ″free unused links timeout″ seconds after the last LU-LU session ends if using independent LUs (including 5250 emulator).
- A link that has been deactivated either because of the inactivity timer or free unused links, can be reactivated by:
  - Pressing Ctrl-Scroll Lock (Restart key).
  - Starting the APPC/CPI-C conversation again.
  - Manually activating the link from subsystem management
- Sometimes the MAC′s buffer is overrun with data, especially if the COM port does not have FIFO. This could cause the link to drop.

Appendix A. Hints and Tips and Restrictions

This appendix summarizes a few of the items that you should be aware of before using SNA Phone Connect.

A.1 Using the WAC Adapter

- Users of the previously available high speed SDLC PRPQ needed to configure the SDLC device driver SDLCDD.SYS in CONFIG.SYS. Note that with SNA Phone Connect, the SDLCDD.SYS is no longer used as it has been replaced with the MPADD.SYS device driver. The SDLCDD.SYS statement in CONFIG.SYS should therefore be removed when you replace the PRPQ with the SNA Phone Connect function; otherwise, you will get an error at boot time.
- Users of AT-bus machines have to watch out for the following:
  1. The IRQ must not conflict with any other adapters in the machine such as token-ring adapters for example. Most adapters use the same default. If the addresses conflict, then the machine will hang when the user starts CM/2.
  2. The slot number parameter references the I/O address of the card which is set by dip switches on the card. (Refer to the *IBM WAC Installation and Testing Instruction* manual). For example:
     - Dip switch = 1 1 0 1 1 1 0 is IRQ 3 and slot number 1.
     - Dip switch = 0 1 0 1 1 1 1 is IRQ 4 and slot number 0.
- Make sure that the MAC configuration for the port name is the same in the PCM configuration as well as in the LAPS configuration for the WAC adapter.
- Make sure that the correct Electronic Interface Board (EIB) is used.
- If the connection stops working and the user is using the WAC adapter, try running the diagnostic program that comes with the adapter to see if the adapter is defective.
- Make sure that you have configured the WAC adapter through LAPS, with the WAC MAC Version 2.x.

A.2 Using the MPA Adapter

- Ensure that the MPA adapter is configured for synchronous operation by using the reference diskette.
- R0CSDD.SYS must be loaded before MPADD.SYS. R0CSDD.SYS is used by the MPA synchronous device driver for CPU information. This is automatically done by CMSETUP.
- The SDLCDD.SYS driver is not used for SNA Phone Connections; rather, MPADD.SYS is used instead. The SDLCDD.SYS driver is used for non SNA Phone Connect DLC-SDLC connection support.
- On AT-bus machines, the MPA MAC only supports one adapter per machine. This may be fixed in an APAR at a later date.

© Copyright IBM Corp. 1995

A.3 PCMCIA Modem

- Ensure that the modem device driver, PlayAtWill or EasyPlay, is installed on the machine.
- Ensure that you configure the proper port, and not a non-existent port.

A.4 General SNA Phone Connect

- To accept an incoming call, make sure to check the “Accept Incoming Call” entry in the DLC-SDLC Using the SNA Phone Connect profile, as well as in the Port Connection Manager profile. Note that the default is to NOT accept any incoming calls.
- On the incoming call machine, if the call is momentarily connected and then the link dropped, it may be that the incoming call directory entry is not defined to accept that particular call, for example:
  - If the incoming call does not match any of the called party numbers in the directory entry, then the call will be rejected.
  - If the user configured for a modem connection type that does not match the one in the incoming call, then the call will be rejected.
- The encoding scheme specified in the Port Connection Manager profile is used to communicate with the modem for initialization, call origination, and incoming call acceptance. The encoding scheme specified in the Connection Manager profile overrides the encoding scheme in Port Connection Manager profile. If the user selects **Use default**, SNA Phone Connect will use the encoding scheme configured in the Port Connection Manager profile. It is recommended that the user configure the directory entry as Use default unless there is a need to connect to two different synchronous modems, which require different encoding schemes.

A.5 Modems

- For synchronous connections, make sure that the modem supports V.25bis BOP for auto-dial connections. Leased-line connections will work without the V.25bis support.
- The modem does not support AutoSync if it does not accept the AT command &Q4. However, even if the modem accepts &Q4, it still may not support AutoSync. Make sure that the modem supports Hayes AutoSync mode in order to use the CM/2 AutoSync feature.

  AutoSync modems that claim AutoSync operation but which CM/2 does not support include:

  1. IBM 14.4 Kbps data/fax external 7851 modem
  2. Hayes V-series smartmodem 9600
  3. Hayes V-series ULTRA smartmodem 9600

  AutoSync modems with known problems that CM/2 does support include:

  1. IBM PCMCIA data/fax modem
  2. IBM PCMCIA high speed data/fax modem
  3. IBM PS/2 14.4 Kbps data/fax modem adapter
  4. Practical Peripherals PM14400FX V.32bis internal modem.

- For modems with dip switches, make sure that the dip switches are set correctly (refer to the modem reference manual). Some examples are:
    1. A dip switch can put the US Robotics Sportster in dumb mode.
    2. A dip switch can instruct the US Robotics Sportster to not accept incoming calls.

  If there are configuration options for the modem that can be configured from both dip switches and AT commands, which are sent by PCM, the dip switches take precedence.

- For synchronous switched modems, make sure that the modem is configured to:
    1. Drop both CD and DSR when the modem detects a loss of carrier or DTR drops. Many modems will default to leaving DSR high. This will prevent the MPA and the WAC card from detecting that an active connection is lost. If this is not configured correctly, SDLC will timeout on its RRs after 80 seconds and APPL will, as a result, clear the call.
    2. Accept incoming calls (auto-answer).

- If the user is using a modem eliminator for:
    1. Synchronous (MPA) connections, make sure that:
        - Clocking is provided for TxC and RxC signals on the physical connection.
        - Make sure that there is a delay (3.6 msecs) between RTS and CTS assertion.
    2. Synchronous (WAC) connections, see the WAC reference manual and CM/2 What′s New reference.
    3. Asynchronous connections, make sure that the NULL modem cable can be used for asynchronous leased lines (refer to What′s New reference for specification).

- Use a synchronous cable for synchronous connections. Most standard RS-232 cables can be used for synchronous modems. However, there are some cables that cannot be used because they may be missing TxC and RxC clock leads.

- Ensure that the modem cable is not defective. If using external modems, and the DTR is not raised, then the cable may be defective. For internal modems, use any asynchronous application to write to the port. If you cannot write to the port, then the cable may be defective or the cable may be plugged in on the wrong port, or the modem is configured for synchronous, etc.

- If the link is dropped suddenly, check the modem power supply. The modem power supply for some modems occasionally go bad.

A.6 AS/400

- If the user changed the CPNAME in CM/2 without changing the name in the AS/400, then the link will not connect.

- Once a connection to the Advantis asynchronous gateway is established, you can never change your node ID. For all subsequent connection attempts, you must always use the same node ID. The asynchronous gateway remembers the CPNAME/node ID pair.

- If the user did not configure the line speed in the AS/400 as **CALC** , then the serial port speed in CM/2 must match the line speed specified in AS/400 configuration.
- If the 5250 logon fails, check the APPC sense code.
- When configured for asynchronous SNA Phone Connections to an AS/400 or to the Advantis network, the link station role on the SDLC using SNA Phone Connections window must be secondary. Neither the AS/400 nor the gateway support primary or negotiable link station roles. Note that the CM/2 default link station role is negotiable. If the link station role is not secondary, the connection may fail to initialize.

A.7 Restrictions

- Use advanced configuration to configure more than one port with the same or different modems attached to the machine.
- SNA Phone Connect does not support the capability of allowing the user to select a modem for a particular call. This is only a problem if you have more than one port/modem.
- Make sure to delete a PCM before configuring another PCM which will use the same port.
- Deleting the PCM does not remove the MAC configuration added to the PROTOCOL.INI when the PCM was configured. It is never deleted; however, it does not hurt anything.
- CM/2 CID does not support PROTOCOL.INI updates. You must create a LAPS response file (refer to response file reference in CM/2 folder).
- Be aware that LAN Distance and CM/2 SNA Phone Connect cannot be used concurrently on the same machine.
- Before using a synchronous modem with CM/2, configure the modem for synchronous operation. Most modems have front panel or dip switches for configuration. Refer to the modem user′s guide for information on how it is configured.
- An asynchronous leased or null modem connection to an AS/400 is not supported because the default framing standard for permanent connection is ISO3309 and cannot be configured as AWP0224.

Appendix B. Communications Manager/2 Reference Summary

This brief reference summary has been compiled mainly as a quick reference guide and should only be used for that purpose.

Its objective is to consolidate information in one location in order to avoid having to look up many different publications.

Because of changes over time, you should also consult the announcement letter and the product publications for more complete and up to date information.

This has been compiled as of August 1994.

Note: The figure entitled ″CM Components and APIs″ has not been updated to show the Version 1.11 SNA Phone Connect components, but a separate figure has been added to show specifically the SNA Phone Connect components and APIs.

Table 9. Product Order Information Summary (US Version) (See Announcement letter)

Program Number	Feature Number	Part Number	Description
5871-AAA	6485	79G0258	CM/2, 3.5″ diskettes
5871-AAA	6486	79G0257	CM/2, CD-ROM
5877-AAA	6497	79G0358	Distributed Feature
5873-AAA	6489	79G0350	Upgrades, 3.5″, from EE, ES, Emulators, CM/400
5873-AAA	6491	79G0352	Upgrades, CD-ROM, from EE, ES, Emulators, CM/400
5873-AAA	6490	79G0351	Upgrades, 3.5″ , from CM/2 1.0
5873-AAA	6492	79G0353	Upgrades, CD-ROM, from CM/2 1.0
5878-AAA	6501	79G0362	Upgrades, Distributed Feature, from any EE, ES
5878-AAA	6499	79G0360	Upgrades, Distributed Feature, from CM/2 1.0

© Copyright IBM Corp. 1995

Table 10. CM/2 Version 1.1 Product Publications (See CM/2 Information and Planning Guide)

Order No.	Part No.	Publication Title	On CD-ROM	Orderable Separately
Online	Base Lic.	What′s New (WHATSNEW.INF)	Yes	
Online	Base Lic.	Overview (OVERVIEW.INF)	Yes	
Online	Base Lic.	Glossary (GLOSSARY.INF)	Yes	
Online	Base Lic.	Command Reference (CMCMDREF.INF)	Yes	
Online	Base Lic.	Message Reference (CMMSGREF.INF)	Yes	
Online	Base Lic.	PD Guide (PDGUIDE.INF)	Yes	
Online	79G0452	Response File Reference (RESPONSE.INF)	Yes	Yes
Online	79G0452	SPAR and ROPS Guide (SPARROPS.INF)	Yes	Yes
Online	Co-Proc.	ISDN PD Guide (ISBAPDG .INF)	No	Yes
Online	CD-ROM	Network Admin and Subsyst. Mgmt. (NETADMIN.INF)	Yes	Yes
Online	CD-ROM	Workstation Install and Cfg Guide(WSINSCFG.INF)	Yes	Yes
		Shipped with CM/2 base license		
SC31-6108	79G0456	User′s Guide	Yes	Yes
SC31-7169	79G0296	Workstation Installation and Config. Guide	Yes	Yes
SX75-0085	79G0460	Quick Installation card	Yes	Yes
SBOF-4393	79G0295	Administrator′s Package (Bill-of-forms)		
SC31-6168	79G0452	Network Administration and Subsystem Mgmt Gde	Yes	Yes
SC31-6170	79G0457	Host Connection Reference	Yes	Yes
SC31-7145	79G0453	Host Print Guide	Yes	Yes
SC31-6174	79G0458	Scenarios	Yes	Yes
SC31-7007	79G0459	Information and Planning Guide	Yes	Yes
	79G0257	CD-ROM package		
		Application Programming Guide	Yes	No
		APPC Programming Reference	Yes	No
		System Management Programming Reference	Yes	No
		ACDI Programming Reference	Yes	No
		EHLLAPI Programming Reference	Yes	No
		ECF SRPI Programming Reference	Yes	No
		X.25 Programming Reference	Yes	No
		LUA Programming Reference	Yes	No
		RTIC Device Driver Programming Reference	Yes	No
		ISDN Connection Mgmt Interface Progr. Ref.	Yes	No
		ISDN Port Connection Manager Programming Ref.	Yes	No
		Glossary (Book Format)	Yes	No
		Response File Reference (Book Format)	Yes	No
		CM/2 ITSO Redbooks	Yes	Yes
		SNA Formats Manual	Yes	Yes
		NTS/2 Publications	Yes	Yes
		APPC, APPN, CPI-C Publications	Yes	Yes

Table 11. Communications Manager ITSO (Redbook) Publications

Number	Title	Publish Date	Comment
GG24-3555	EE 1.2 CM 3270/5250 Emulator Services/API′s	01/90	Useful - EHLLAPI & SRPI examples
GG24-3553	EE 1.2 CM SNA Environment	04/90	Useful - APPC & LUA examples
GG24-3554	EE 1.2 CM SDLC, X.25 and LAN Environment	05/90	Useful - X.25, NetBIOS & 802.2 examples
GG24-3602	EE 1.3 Enhancements-Perf. & Capacity Optimization	04/91	Useful - Gateway performance study
GG24-3662	NS/2 Install/Custom. & Ops-APPN for OS/2	07/91	Useful - Good intro to OS/2 APPN
GG24-3876	ES CM New Features and Enhancements	09/92	Useful - Extended Services
GG24-3958	CM/2 Version 1.0 New Features	02/93	Current
GG24-4142	CM/2 Version 1.1 New Features	10/93	Current
GG24-4005	OS/2 Communications Products Coexistence	10/93	Current

Table 12. CM/2 Connectivity Summary

Connection	**Services Available**
ASYNC	Softronic's Custom Plus ASCII Emulator SNA PHONE CONNECT
COAX	3270 Emulation (SNA & non-SNA) LAN over Coax (3174), including LU 6.2
TWINAX	3270 Emulation 5250 Emulation LU 6.2
SDLC	3270 Emulation 5250 Emulation LU 0,1,2,3 LU 6.2 SNA PHONE CONNECT
X.25	3270 Emulation 5250 Emulation LU 0,1,2,3 LU 6.2 Non-SNA (OSI level 3) SNA PHONE CONNECT
ISDN	3270 Emulation 5250 Emulation LU 0,1,2,3 LU 6.2 SDLC 802.2 NetBIOS X.25 IDLC SNA PHONE CONNECT
LAN TOKEN RING PC NETWORK ETHERNET 802.3 FDDI	3270 Emulation 5250 Emulation LU 0,1,2,3 LU 6.2 NetBIOS 802.2

Table 13. Available APIs

API	Description
CM Kernel	Start/Stop/Query of major CM components.
ACDI	Standardized API for accessing serial ports.
ACDI REDIRECTION	Redirects Async communications across a LAN to a LAN server with LANACS.
APPC	Advanced Program-to-Program Communications.
SAA CPI-C	SAA Common Programming Interface for Communications.
EHLLAPI	For 3270 and 5250 terminal emulation. Intercept and respond to host messages, auto logon, etc.
SRPI	Allow a workstation program to call a host program and the host to return results asynchronously. Operates over a 3270 emulator session.
X.25	To develop programs that need access to a PSDN.
LUA	An interface which supplies I/O service routines to support communications using secondary. dependent LUs such as LU 0, 1, 2 and 3.
CMI	Connection Manager interface - API between applications and Connection Manager to control connections.
GCCI	Generalized Call Control Interface - API between Connection Manager and the Port Connection Managers.
SCPI	Switched Connection Programming Interface - API between the Port Connection Manager and the MACs. SCPI is a particular implementation of ANDIS Real-time Connection Control Interface (ARCCI).
RTIC	Device Driver Programming Interface for the RTIC.
SPAR/ROPS	Network Management API.
COMMON SERVICES	Allows Problem Determination functions under program control.
SYSTEM MANAGEMENT	To control communications resources, start/stop links, sessions, applications, etc.

Table 14. Line Speeds (See CM/2 Information and Planning Guide)

Protocol/Connection	Supported Line Speeds
SDLC Adapter (switched and leased) IBM Multiprotocol Adapter (switched and leased)	19.2 Kbps
SDLC using SNA Phone Connect (synchronous switched)	56 Kbps
SDLC using SNA Phone Connect (synchronous leased)	64 Kbps
SDLC using SNA Phone Connect (asynchronous)	57.6 Kbps
ASYNC without Direct Memory Access	19.2 Kbps
ASYNC with DMA (Direct Memory Access)	64 Kbps
X.25 using X.21bis/V.24	19.2 Kbps
X.25	64 Kbps
Token Ring FDDI	16 Mbps 100 Mbps
ISDN - SDLC, X.25, IDLC (per B-channel)	64 Kbps
ISDN (D-channel/X.25)	16 Kbps

Table 15. SNA Gateway Summary (See CM/2 Information and Planning Guide)

Upstream DLC	SDLC (Switched or leased) X.25 Token Ring (802.2 only) ETHERAND Twinax (for 3270 passthru) SDLC, X.25, and IDLC over ISDN SDLC and X.25 using SNA PHONE CONNECT (Synchronous, Asynchronous, AutoSync)
Downstream DLC	SDLC (Switched or leased- Point to point) X.25 Token Ring (802.2 only) PC Network ETHERAND 3174 Peer Communications SDLC, X.25, and IDLC over ISDN SDLC and X.25 using SNA PHONE CONNECT (Synchronous, Asynchronous, AutoSync)
Supported LU types	LU 0, LU 1, LU 2, LU 3, and dependent LU 6.2
Active sessions	254 per PU
Active workstations	254 per LAN adapter 128 (X.25)
Mode of operation	Multiple downstream PUs. PUs not visible to the host.
Segmenting supported	YES
Multiple PU Support	YES (unlimited definitions; 5 PUs tested)
LU pooling	YES
Auto-Logoff support	YES
Implicit Workstation Support	YES
Dynamic Adds and Changes	YES
Downstream workstations with	IBM Communications Manager (EE,ES,CM/2) IBM Personal Communications/3270 IBM PC 3270 Emulation Program V 3.0 IBM 3270 Workstation Program V 1.1 IBM DOS APPC/PC IBM NS/DOS Novell Netware for SAA V1.3 Wall Data Rumba V4.0 Attachmate Extra V4.0 DCA IRMA V2.0 - IRMA for OS/2 and IRMA Windows for 3270 Apple MAC SNA*ps Gateway

Table 16. APPN Support (See CM/2 Information and Planning Guide)

Node Type	**Attach to**
Network Node	Any product supporting the End Node or Network Node architecture
End Node	Any product supporting attachment of End Nodes

Table 17. Supported Adapters (See CM/2 Information and Planning Guide)

Machine Type	**Adapter Card**	**Maximum Number (*)**
Laptop computers with the PCMCIA interface	IBM PCMCIA 3270 Adapter	1
	IBM PCMCIA 5250 Adapter	1
	PCMCIA Modems (Asynchronous, Synchronous, AutoSync)	3
	PCMCIA LAN Adapters (NTS/2 NDIS compliant)	2
Non-micro channel PS/2s ValuePoints Ambras Industrial PCs PS/1s OEM PS/2 equivalents	LAN Adapters	2
	IBM ISDN Interface Coprocessor	4
	IBM SDLC Adapter	1
	Microgate Digital Services Adapter	2
	IBM Multiprotocol Communications Adapter	1
	IBM X.25 Co-processor	8
	IBM Wide Area Connector	2 ports
	IBM WaveRunner Digital Modem	3
	IBM Serial/Parallel Adapter, Asynchronous port	3
	Serial COM Ports	3
	Adapters emulating Serial COM Ports	3
	Coaxial Adapters:	
	- IBM Advanced 3278/79 Emulation Adapter	1
	- IBM 3278/79 Emulation Adapter	1
	- DCA IRMA 3 Convertible Adapter	1
	- Attachmate Advanced 3270 Adapter	1
	Twinaxial Adapters:	
	- IBM Enhanced 5250 Display Station Emulator Adapter	1
	IBM Realtime Interface Coprocessor Multiport	# of slots
PS/2 Micro Channel models IBM Value Points IBM Premiums IBM Pentiums IBM Industrial PCs OEM PS/2 equivalents	LAN Adapters including	2
	- IBM 8240 FDDI Fiber Adapters	
	- IBM 8240 FDDI Copper Adapters	
	IBM ISDN Interface Coprocessor/2 Model 2	4
	IBM PS/2 Dual Asynchronous Adapter/A	2
	IBM X.25 Interface Coprocessor/2	8
	IBM PS/2 Multiprotocol Adapter/A (SDLC, Asynchronous)	2
	IBM Wide Area Connector	2 Ports
	IBM WaveRunner Digital Modem	3
	IBM Asynchronous/SDLC V.32 Modem/A	2
	Serial COM Ports	3
	Adapters emulating Serial COM Ports	3
	Coaxial Adapters:	
	- IBM 3270 Connection (DFT)	1
	- DCA IRMA 3 Convertible	1
	- Attachmate Advanced 3270 Adapter/2	1
	Twinaxial Adapters:	
	- IBM 5250 Emulation Adapter/A	1
	- IBM S/36/38 Workstation Emulation Adapter/A	1
	IBM P370 Adapter	1
	IBM Realtime Interface Coprocessor Multiport/2	# of slots
	IBM Realtime Interface Coprocessor Portmaster Adapter/A	# of slots

* The Maximum number of adapters may be further limited by the number of slots available in the machine.

Table 18. New or Modified Commands. Details in Online Command Reference.

Command	**Description**
CMREPL	Replace default CFG file
CMSETUP	Installation/Configuration (Replaced APPNC)
CMUPGRAD	Upgrade a configuration file (Replaced APPNMIG)
CMVERIFY	Verify a CFG file (Replaced APPNV)
KEYLOCK	Lock a configuration file
CMLAN	Install a distributed Workstation
CMSERVER	Enable the Server function
VHAPINST	Install/Delete the EHLLAPI Virtual DD
CM	Start a session and return control
CMSTOP	Stop CM
SEND	Send a file to the host
RECEIVE	Receive a file from the host
CMANSWER	Enable reception of incoming ISDN calls
CMCALL	Establish outgoing ISDN calls
CMTELNUM	To change phone numbers in directory entries
CMGWSESS	Display gateway sessions
CMIMAGE	Copy product diskettes to a directory
CMQUERY	Provide status of CM components
CMRECORD	Produce a CID Response file
ESLANX	Configure the ES version of LAPS
APPNRST	Rebuild a NDF file from a CF2 file
CMTRACE	Start a CM/2 trace
FMTTRACE	Format a CM/2 trace
DISPLAY	Display active SNA resources
PMDSPLAY	Display active SNA resource (PM)
REDIRECT	Redirection of ACDI
ACSSBMGT	Start Subsystem Management
CMEMPNL	Start the Manage 3270/5250 sessions panel
ACSGCCRT	Extract code page table into current directory
HGINST	Install the GGDM OS/2 Link code (N/A in V 1.11)
HGREMOVE	Remove GDDM OS/2 Link code (N/A in V 1.11)
ACSGCCRT	Extract code page tables (xxxxx.CPT)
COPYKBD	Copy keyboard profiles
CMBKCFG	Backup configurations (Replaced COPYCFG)
CMRSTCFG	Restore configurations
APPNT	Start a predefined APPC/APPN trace
APPNF	Format a predefined APPC/APPN trace
CMPD	Package all information required by IBM service
QSYSTEM	Display hardware and software info summary
SYSLOG	View error log
ISBAMON	Start the ISDN monitor
LOGON	Logon to UPM
LOGOFF	Logoff from UPM
UPMACCTS	Start UPM menu
UPMCSET	Specify character set
RTR	Start/Stop the SPA router
ROP	Start/Stop ROPS
ROPESP	Start/Stop ROPS ESP
CMLINKS	CLI command for logical links
CMDLC	CLI command for DLCs
CMTPS	CLI command for transaction programs
CMNETB	CLI command for NetBIOS sessions

Table 19. CONFIG.SYS Statements (See also Online Command Reference)

ACDI (micro-channel) ACDI (Mod 90/95 with DMA enabled) ACDI (non-micro) ACDI Redirection	DEVICE=x:\CMLIB\ASYNCDDB.SYS DEVICE=x:\CMLIB\ASYNCDDC.SYS DEVICE=x:\CMLIB\ASYNCDDA.SYS DEVICE=x:\CMLIB\ASYNCDDE.SYS servername
SNA PHONE CONNECT - Asynchronous SNA PHONE CONNECT - AutoSync SNA PHONE CONNECT - MPA Synchronous SNA PHONE CONNECT - WAC Synchronous	DEVICE=x:\IBMCOM\MACS\COMMAC.SYS DEVICE=x:\IBMCOM\MACS\HAMMAC.SYS DEVICE=x:\CMLIB\R0CSDD.SYS DEVICE=x:\IBMCOM\MACS\MPADD.SYS DEVICE=x:\IBMCOM\MACS\IBMWAC.OS2
COAX (DFT) Adapter	DEVICE=x:\CMLIB\DFTDD.SYS
SDLC and MPA Adapter for ISA MPA Adapter (micro channel)	DEVICE=x:\CMLIB\R0CSDD.SYS DEVICE=x:\CMLIB\SDLCDD.SYS DEVICE=x:\CMLIB\R0CSDD.SYS DEVICE=x:\CMLIB\SDLCDD.SYS x y DEVICE=x:\CMLIB\ACSVPCM.OS2
Twinax adapter (non-micro channel and all micro channel with adapter #64G3494) Twinax adapter (all micro channel with adapter #69X6279) Twinax adapter (PCMCIA)	DEVICE=x:\CMLIB\T1P1SDD.SYS CFG=x:\CMLIB\name.CFG DEVICE=x:\CMLIB\T1P1NDD.SYS CFG=x:\CMLIB\name.CFG DEVICE=x:\CMLIB\T1P1CDD.SYS CFG=x:\CMLIB\name.CFG
X.25 ARTIC Adapter X.25 Co-processor Adapter	DEVICE=x:\CMLIB\ICARICIO.SYS x
ISDN Adapter	DEVICE=x:\CMLIB\ISBARIC.SYS DEVICE=x:\CMLIB\ISBADD.SYS
SNA Phone Connect Device Driver Message Logging	DEVICE=x:\CMLIB\GENMSGDD.OS2 RUN=x:\CMLIB\GENMSGEX.EXE
SDLC using SNA PHONE CONNECT	DEVICE=x:\CMLIB\SDLCSNET.OS2 DEVICE=x:\CMLIB\SDLCVMAC.SYS
X.25 using SNA PHONE CONNECT	DEVICE=x:\CMLIB\X25DD.SYS DEVICE=x:\CMLIB\X25VMAC.SYS RUN=x:\CMLIB\RUNX25.EXE /N
IDLC over SNA PHONE CONNECT	DEVICE=x:\CMLIB\IDLCPD.SYS DEVICE=x:\CMLIB\IDLCDD.SYS DEVICE=x:\CMLIB\IDLCVMAC.SYS
LAN over ISDN	DEVICE=x:\CMLIB\LANVMAC.SYS
SNA over LAN	DEVICE=x:\CMLIB\ACSLANDD.SYS
APPC/APPN (with OS/2 V 2.x)	DEVICE=x:\CMLIB\CMKFMDE.SYS
FFST/2	DEVICE=x:\OS2\EPWDD.SYS RUN=x:\OS2\EPWDDR3.SYS RUN=x:\OS2\EPW.EXE RUN=x:\OS2\EPWROUT.EXE 1
LAPS Protocol Manager	DEVICE=x:\IBMCOM\PROTMAN.OS2 /I:x:\IBMCOM RUN=x:\IBMCOM\PROTOCOL\NETBIND.EXE DEVICE=x:\IBMCOM\LANMSGDD.OS2 /I:x:\IBMCOM RUN=x:\IBMCOM\PROTOCOL\LANMSGEX.EXE
NETBIOS Protocol	DEVICE=x:\IBMCOM\PROTOCOL\NETBEUI.OS2 DEVICE=x:\IBMCOM\PROTOCOL\NETBIOS.OS2
802.2 Protocol	DEVICE=x:\IBMCOM\PROTOCOL\LANDD.OS2 DEVICE=x:\IBMCOM\PROTOCOL\LANDLLDD.OS2 RUN=x:\IBMCOM\PROTOCOL\LANDLL.EXE DEVICE=x:\IBMCOM\PROTOCOL\LANPDD.OS2 DEVICE=x:\IBMCOM\PROTOCOL\LANVDD.OS2
IBM TRN Adapter/A IBM TRN Busmaster Adapter IBM PC Network Baseband IBM PC Network Adapter II IBM 3287/79 Emulation adapter IBM Ethernet/A	DEVICE=x:\IBMCOM\MACS\IBMTOK.OS2 DEVICE=x:\IBMCOM\MACS\IBMTRBM.OS2 DEVICE=x:\IBMCOM\MACS\IBMNET.OS2 DEVICE=x:\IBMCOM\MACS\IBMNETA.OS2 DEVICE=x:\IBMCOM\MACS\IBMXLN.OS2 DEVICE=x:\IBMCOM\MACS\MACETH.OS2

Table 20. Configuration Files

Filename	Subdirectory	Format	View with	Description
Name.CFG	CMLIB	Binary	N/A	Main Configuration file
Name.NDF	CMLIB	ASCII	Editor	SNA Configuration
Name.CF2	CMLIB	Binary	N/A	Operational Configuration
Name.SEC	CMLIB	Binary	N/A	Security Information
SNAPHONE.CXM	CMLIB	Binary	N/A	Connection Manager Directory
CM.INI	CMLIB	ASCII	Editor	CM Initialization Data
NETWORK.INI	CMLIB	ASCII	Editor	ISDN Network Information
PROTOCOL.INI	IBMCOM	ASCII	Editor	LAPS configuration Data
APPNV.CTL	CMLIB	ASCII	Editor	Verification control file
CMVERIFY.TXT	CMLIB	ASCII	Editor	Sample NDF Commands

Table 21. Log and Error Files

Filename	Subdirectory	Format	View with	Description
UPGRADE.LOG	CMLIB	Binary	FFST/2	Upgrade log
VERIFY.LOG	CMLIB	Binary	FFST/2	Verification log
CMRINST.LOG	CMLIB	ASCII	Editor	CID log
OS2MLOG.DAT	OS2/SYSTEM	Binary	FFST/2	Message log
LOG0001.DAT	OS2/SYSTEM	Binary	FFST/2	Error log
EPWALERT.DMP	OS2/SYSTEM	Binary	FFST/2	Alerts logged
ALRTNPOP.TXT	CMLIB	ASCII	Editor	Non-Pop-up messages
OS2SYSxx.DMP	OS2/SYSTEM	Binary	FFST/2	System dumps
OS2APLxx.DMP	OS2/SYSTEM	Binary	FFST/2	Application dumps

Table 22. Memory Requirements (MB) (See CM/2 Information and Planning Guide)

Component	Hard Disk	Memory
BASE CODE	6.9	0.7
3270/5250	2.2	0.7
Gateway (per PU)	0.1	0.3
APPC/APPN	1.0	0.5
LUA	0.3	0.6
File Transfer	-	1.7
3270 Host Print	-	1.4
ISDN	-	0.6
X.25 Communications	1.3	-
SDLC Communications	0.2	-
SDLC over ISDN	0.5	-
X.25 over ISDN	1.4	-
IDLC over ISDN	0.5	-
Configuration Svcs	3.3	-
Keyboard Remap	0.4	-
APIs	1.1	-
Distributed Feature	1.0	-
ACDI	0.1	-
Remote Operations	0.6	-
Subsystem Mgmt	0.7	-
Command Reference	0.2	-
Message Reference	1.9	-
PD Aids	0.8	-
Overview	0.2	-
Glossary	0.5	-
Typical Single user	10 to 12	1.4 up
Distributed Workstation	< 1	1.4 up

Table 23. Supported Keyboards

IBM Personal Computer AT keyboard
IBM Enhanced Personal Computer AT keyboard
IBM Host Connected keyboard (122 key)(U.S. and France)
IBM PS/1 Select Touch keyboard
IBM 5576 Enhanced PC keyboard 001,002,003, A01,B01 for DBCS countries

Table 24. Verbs Summary

SUBSYSTEM MANAGEMENT VERBS ACTIVATE_DLC DEACTIVATE_DLC ACTIVATE_LOGICAL_LINK DEACTIVATE_LOGICAL_LINK CNOS DEACTIVATE_SESSION DEACTIVATE_CONVERSATION_GROUP ACCEPT_INCOMING_CALLS REJECT_INCOMING_CALLS START_AM STOP_AM CONNECT_PHYSICAL_LINK (X.25 only) DISCONNECT_PHYSICAL_LINK (X.25 only) DISPLAY DISPLAY_APPN
MANAGEMENT SERVICES VERBS REGISTER_MS_APPLICATION TRANSFER_MS_DATA SEND_MDS_MU
CM KERNEL VERBS CmkKernelReg ActivateService DeactivateService QueryServices QueryStatus
COMMON SERVICES VERBS CONNECT_PHYSICAL_LINK (X.25 only) DISCONNECT_PHYSICAL_LINK (X.25 only) CONVERT COPY_TRACE_TO_FILE DEFINE_DUMP DEFINE_TRACE DISPLAY GET_CP_CONVERT_TABLE LOG_MESSAGES TRANSFER_MS_DATA
CONFIGURATION VERBS See NDF summary

Table 25. Additional CM/2 Functions

Function	Size (KB)	Description
Command Reference	253	Online Command Reference
Message Reference	1406	Online Message Reference
Interactive Configuration	4657	Configuration User Interface
Keyboard Remap	507	To remap the keyboard layout
Keylock	40	To lock the configuration file
Problem Determination Aids	909	Trace and dump tools
Subsystem Management	794	Display/control the CM environment
Remote Operations (SPAR/ROPS)	507	Service Point Application Router Remote Operation Services
UPM	909	User Profile Management
PD Guide	470	Online PD Guide
Glossary	438	Terminology
Overview	110	Introduction to CM functions
AnyNet/2	155	AnyNet/2 Support
APL Font Support	270	Support APL characters in 3270 session
Host Graphics-OS/2 Link	417	Support for GDDM - OS/2 Link
Response File Reference	432	CID response file keyword reference

Table 26. Productivity Aids Shipped with CM/2

CM/2 Version	Aid	Description
Version 1.0	ACPM	PM front end to ALMCOPY
	ALMCOPY	File transfer alternative to send/receive
	NNLINK	Monitor/Keep CP-CP link active
	MOUSE3270	Alternative mouse support for 3270
	CMMOUSE	Alternative mouse support for 3270
	3270PDT	Printer definition tables for 3270 Host Print
	CMWAIT	Wait for an event before starting CM
	PCPRINT	Local print utility for emulators
	PD	PD tools
	CPICPGMS	Sample CPIC Pgms such as ATELL
	GAMES	APPC program games
	TOGGLE	To switch 3270 sessions with hot key
Version 1.1	CMEMUL	Start 3270 sessions from CLI
	CMRTM	Response time monitor for 3270 sessions
	RIPL	Aid to install CM/2 on RIPL clients/server
	NWSTAT	Find out status of session with NetWare server
Version 1.11	AFTP	File transfer for APPC
	ANAME	Global facility for network naming to create aliases
	LP3820	Print LIST38XX files on a PC laser printer (CD-ROM only)
	CMPROC	List active CM/2 processes
	DCAFSAMP	Instructions and sample files for configuring CM/2 for DCAF
	LOGMSG	To create and log messages to the message log
	CMCHGDIR	Reassign remote drive of a server for distributed workstations
	CMFOLDER	Create OS/2 2.x folders and customize CM/2 folder
	RPLINI	Start when installing CM/2 for RIPL

Table 27. Maximum Link Activation Attempts Defaults

DLC Type	Default Value
Twinax	0
LAN	0
SDLC	3
SDLC using Phone Connect	3
X25	3
IDLC using Phone Connect	3

Table 28. Enhancements Introduced in Extended Services - Fall 92

APPN support
Persistent Verification
5250 Emulation in an OS/2 window
3270 Jump Key
Gateway support for 254 LUs
Gateway LU pooling enhancements
Gateway supports segmentation
ACDI Redirection API
CPI-C API
REXX support for EHLLAPI API
DOS EHLLAPI VDM
Long filenames in EHLLAPI
ACDI DMA support
LAN over COAX
PM configuration for SNA data
Programmable Configuration
CID Support
File Transfer long filenames support
SPAR/ROPS
Formatted trace
SNA MS MDS support
Held Alerts
Backup Focal Point
MS Migration support (NMVT-MDS-MU)
FFST/2 introduction

Table 29. Enhancements Introduced in CM/2 Version 1.0 - Feb 93

Converged 3270/5250 emulators
Maximum 3270 emulator sessions = 26
PM based emulator keyboard remap
PM based emulator color remap
Emulator cursor row/col position in OIA
Emulator alarm remap
5250 emulator session restart
Dynamic gateway definitions
Gateway Implicit workstation support
Multiple host links support
API support for 32-bit C Set/2 Programs
ISDN CMI API
ISDN PVM API
CMKernel API
ISDN adapter basic rate support
SDLC protocol over ISDN
X25 protocol over ISDN
LAN protocols over ISDN
PM based installation and configuration
One single install/configuration command
Redirected drive support for installation
Multiple PU Support(3)
Automatic DLC reactivation
UPM logon profile
Dynamic LUA definitions
Message reference online
Command reference online
Support for routing alerts to LNM
Implicit Focal Point support
Nested Focal Point support
Enhanced MS migration support
SNA Management Gateway support for Netware (V 1.01)
Support for the AT-bus ISDN Interface Coprocessor (V 1.01)

Table 30. Enhancements Introduced in CM/2 Version 1.1 - Nov 93

LU 6.2 Full duplex
Emulator Mouse/Hot spots
Emulator Auto font sizing
Emulator Pop-up keypads
Emulator Menu bar pull-downs
PM based emulator file transfer support
National Language Versions (French, German, Italian, Japanese, Korean)
Double Byte Character Support (DBCS)
Response Time Monitoring support
PCMCIA 3270 adapter
ISDN/IDLC protocol
Maximum Link Activation attempts for 3270, gateway and LUA
CID removal of additional functions
Multiple PU Support (5 PUs)
Data Compression Support
Anynet/2 enablement
Distributed Workstation Feature
SRPI,LUA, EHLLAPI and ACDI API trace formatting
IDLC protocol trace formatting
ROPS Extended Service Point
Online PD Guide
Online Sense codes
Online APPC codes
Online SPAR/ROPS Guide
Online Response File Information
NLS version for French, German, Italian and Japanese

Table 31. Enhancements Introduced in CM/2 Version 1.11 - May 94

- SNA PHONE CONNECT
  - Automatic dialing capabilities for:
    - Synchronous communications (MPA or WAC adapters)
    - Asynchronous communications (SNA over ASYNC)
    - AutoSync communications
  - SDLC and X.25 protocols
- X.32 Dial up to X.25 network
- X.25 Network Userid facility
- X.25 Closed User Group facility
- X.25 Xpander/2 support
- Link Inactivity timeout parameter
- Free Unused Link timeout parameter
- Configuration Support on distributed workstations
- PCMCIA 5250 Adapter
- 64Kbps SDLC support (replaces High Speed SDLC/2 PRPQ)
- IBM WaveRunner Digital modem support
- Interoperability with VTAM Border Node
- Dependent LU Requester Enablement
- Import/Export for 3270 with OV/MVS
- Integrated Host Graphics support (GDDM)
- APL Support for 3270 Emulation
- CID CMUPDATETYPE=7 for CM removal
- NLS versions for Korean and Spanish

Table 32 (Page 1 of 4). NDF Configuration File Summary (See Online CMVERIFY.TXT)

COMMAND **PARAMETER**	**Status**	**Dynamic Update**	**PM panels**	**System Mgmt. Verb**	**Response File**
DEFINE_LOCAL_CP		No		No	Yes
FQ_CP_NAME			Yes		
DESCRIPTION			Yes		
CP_ALIAS			Yes		
NAU_ADDRESS			No		
NODE_TYPE			Yes		
NODE_ID			Yes		
HOST_FP_SUPPORT			Yes		
HOST_FP_LINK_NAME			Yes		
NW_FP_SUPPORT	New(1.01)		Yes		
NW_SERVER_NAME	New(1.01)		Yes		
MAX_COMP_LEVEL	New in 1.1		Yes		
MAX_COMP_TOKENS	New in 1.1		Yes		
DEFINE_CONNECTION_NETWORK		No	Yes	No	Yes
FQ_CN_NAME					
ADAPTER_INFO					
ADAPTER_NUMBER					
DLC_NAME					
DESCRIPTION					

Table 32 (Page 2 of 4). NDF Configuration File Summary (See Online CMVERIFY.TXT)

COMMAND **PARAMETER**	**Status**	**Dynamic Update**	**PM panels**	**System Mgmt. Verb**	**Response File**
DEFINE_LOGICAL_LINK		Yes		Yes	Yes
LINK_NAME			Yes		
DESCRIPTION			Yes		
DLC_NAME			Yes		
ACTIVATE_AT_STARTUP			Yes		
CP_CP_SESSION_SUPPORT			Yes		
ADAPTER_NUMBER			Yes		
ADJACENT_NODE_TYPE			Yes		
PREFERRED_NN_SERVER			Yes		
DESTINATION_ADDRESS			Yes		
ADJACENT_NODE_ID	New in 1.0		Yes		
FQ_ADJACENT_CP_NAME			Yes		
X25_DIRECTORY_ENTRY			Yes		
OCDT_ENTRY_NAME	New in 1.0		Yes		
EFFECTIVE_CAPACITY			No		
COST_PER_BYTE			No		
COST_PER_CONNECT_TIME			No		
PROPAGATION_DELAY			No		
SECURITY			No		
USER_DEFINED_1			No		
USER_DEFINED_2			No		
USER_DEFINED_3			No		
LIMITED_RESOURCE			No		
LINK_STATION_ROLE			No		
SOLICIT_SSCP_SESSION			Yes		
PU_NAME	New in 1.0		Yes		
NODE_ID	New in 1.0		Yes		
ETHERNET_FORMAT	New in 1.1		Yes		
MAX_ACTIVATION_ATTEMPTS	New in 1.1		Yes		
USE_PUNAME_AS_CPNAME	New in 1.1		No		
IDLC_PARMS	New in 1.1		No		
DEFINE_LOCAL_LU		Yes	Yes	Yes	Yes
LU_NAME					
DESCRIPTION					
LU_ALIAS					
NAU_ADDRESS					
HOST_LINK_NAME	New in 1.0				
DEFINE_PARTNER_LU		Yes		Yes	Yes
FQ_PARTNER_LU_NAME			Yes		
DESCRIPTION			Yes		
PARTNER_LU_ALIAS			Yes		
PARTNER_LU_UNINTERPRETED_NAME			Yes		
MAX_MC_LL_SEND_SIZE			No		
CONV_SECURITY_VERIFICATION			Yes		
PARALLEL_SESSION_SUPPORT			Yes		
DEFINE_PARTNER_LU_LOCATION		Yes		Yes	Yes
FQ_PARTNER_LU_NAME			Yes		
DESCRIPTION			Yes		
WILDCARD_ENTRY			No		
FQ_OWNING_CP_NAME			Yes		
LOCAL_NODE_NN_SERVER			Yes		
FQ_SERVING_NN_CP_NAME			No		
DEFINE_COS		Yes	No	Yes	Yes
COS_NAME					
TRANSMISSION_PRIORITY					
NODE_ROW					
TG_ROW					
DESCRIPTION					

Table 32 (Page 3 of 4). NDF Configuration File Summary (See Online CMVERIFY.TXT)

COMMAND **PARAMETER**	**Status**	**Dynamic Update**	**PM panels**	**System Mgmt. Verb**	**Response File**
DEFINE_MODE		Yes	Yes	Yes	Yes
MODE_NAME					
DESCRIPTION					
COS_NAME					
DEFAULT_RU_SIZE					
MAX_RU_SIZE_UPPER_BOUND					
RECEIVE_PACING_WINDOW					
MAX_NEGOTIABLE_SESSION_LIMIT					
PLU_MODE_SESSION_LIMIT					
MIN_CONWINNERS_SOURCE					
COMPRESSION_NEED	New in 1.1				
PLU_SLU_COMPRESSION	New in 1.1				
SLU_PLU_COMPRESSION	New in 1.1				
DEFINE_DEFAULTS		No		No	Yes
IMPLICIT_INBOUND_PLU_SUPPORT			No		
DESCRIPTION			No		
DEFAULT_MODE_NAME			No		
MAX_MC_LL_SEND_SIZE			No		
DIRECTORY_FOR_INBOUND_ATTACHES			Yes		
DEFAULT_TP_OPERATION			Yes		
DEFAULT_TP_PROGRAM_TYPE			Yes		
DEFAULT_TP_CONV_SECURITY_RQD			Yes		
MAX_HELD_ALERTS			No		
DEFAULT_LOCAL_LU_ALIAS	New in V 1.11		Yes		
DEFINE_EXPLICIT_SOC	New in 1.0	Yes	No	Yes	Yes
USER_DEFINED_MS_CATEGORY					
SNA_DEFINED_MS_CATEGORY					
FQ_SOC_NODE_NAMES					
REPLACE_BACKUP_FP					
FQ_BACKUP_FP_NAME					
DESCRIPTION					
DEFINE_DEFAULT_SOC	New in 1.0	Yes	No	Yes	Yes
USER_DEFINED_MS_CATEGORY					
SNA_DEFINED_MS_CATEGORY					
REPLACE_BACKUP_FP					
FQ_BACKUP_FP_NAME					
DESCRIPTION					
DEFINE_REMOTE_FOCAL_POINT	New in 1.0	Yes	No	Yes	Yes
USER_DEFINED_MS_CATEGORY					
SNA_DEFINED_MS_CATEGORY					
FQ_PRIMARY_FP_NAME					
FQ_BACKUP_FP_NAMES					
DESCRIPTION					
DEFINE_TP		Yes		Yes	Yes
TP_NAME			Yes		
SNA_SERVICE_TP_NAME			Yes		
DESCRIPTION			Yes		
FILESPEC			Yes		
ICON_FILESPEC			Yes		
PARM_STRING			Yes		
CONVERSATION_TYPE			No		
CONV_SECURITY_RQD			Yes		
SYNC_LEVEL			No		
TP_OPERATION			Yes		
PROGRAM_TYPE			Yes		
INCOMING_ALLOCATE_QUEUE_DEPTH			No		
INCOMING_ALLOCATE_TIMEOUT			No		
RECEIVE_ALLOCATE_TIMEOUT			No		
PIP_ALLOWED	New in 1.0		No		
DEFINE_CPIC_SIDE_INFO		Yes	Yes	Yes	Yes
SYMBOLIC_DESTINATION_NAME					
DESCRIPTION					
PARTNER_LU_ALIAS					
FQ_PARTNER_LU_NAME					
MODE_NAME					
TP_NAME					
SNA_SERVICE_TP_NAME					

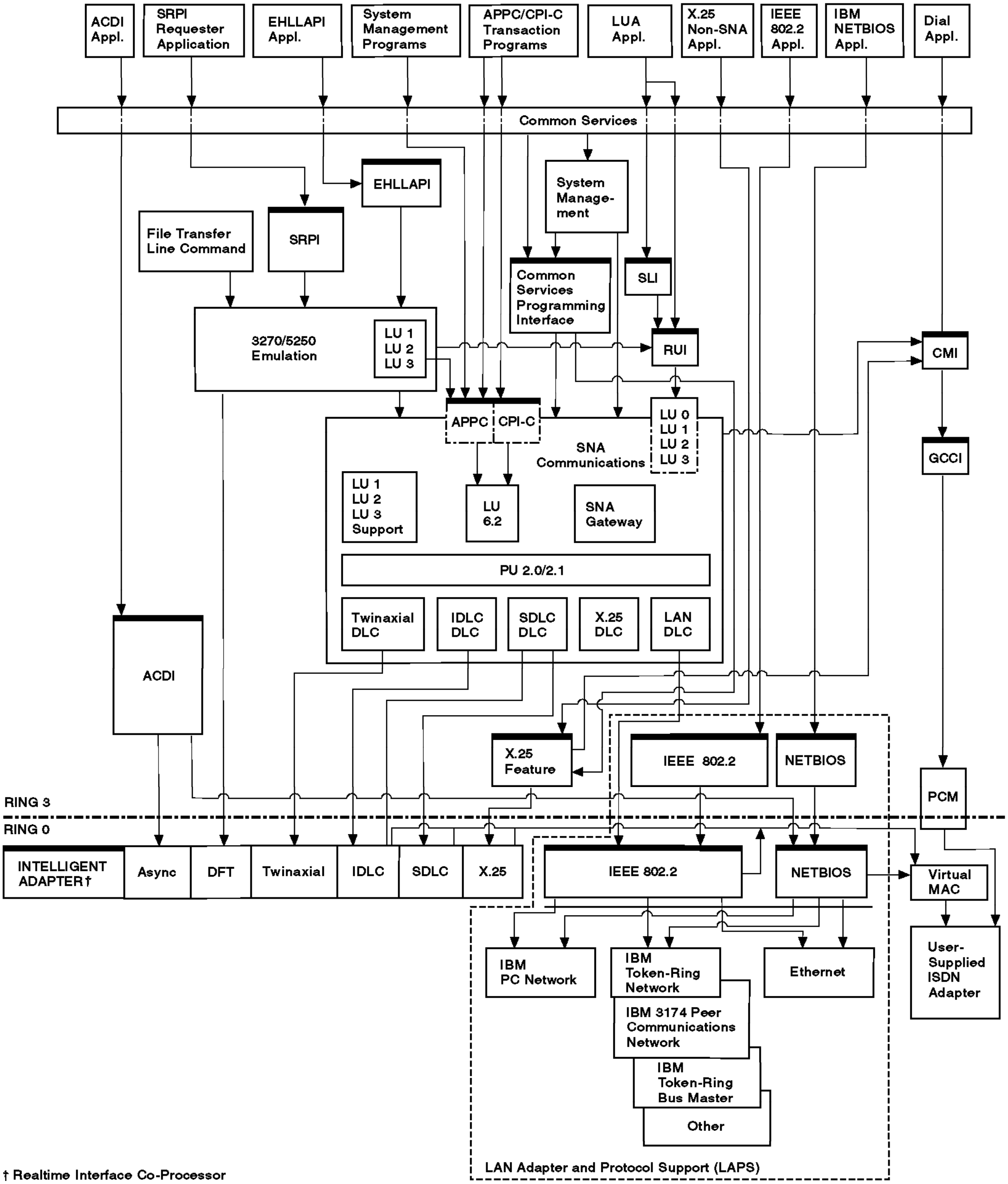
Table 32 (Page 4 of 4). NDF Configuration File Summary (See Online CMVERIFY.TXT)

COMMAND **PARAMETER**	**Status**	**Dynamic Update**	**PM panels**	**System Mgmt. Verb**	**Response File**
START_ATTACH_MANAGER No parameters		No	Yes	Yes	Yes
ACTIVATE_LOGICAL_LINKS LINK_NAME		Yes	No	Yes	Yes
CNOS LOCAL_LU_ALIAS PARTNER_LU_ALIAS FQ_PARTNER_LU_NAME MODE_NAME SET_NEGOTIABLE PLU_MODE_SESSION_LIMIT MIN_CONWINNERS_SOURCE MIN_CONWINNERS_TARGET RESPONSIBLE DRAIN_SOURCE DRAIN_TARGET AUTO_ACTIVATE		Yes	No	Yes	Yes
DEFINE_LUA LU_NAME NAU_ADDRESS HOST_LINK_NAME DESCRIPTION	New in 1.0	Yes	Yes	Yes	Yes
DEFINE_GATEWAY_WORKSTATION WORKSTATION_LINK_NAME DLC_NAME WORKSTATION_LU WORKSTATION_LU_NAME HOST_LINK_NAME NAU_ADDRESS_AT_WORKSTATION NAU_ADDRESS_AT_HOST POOL_NAME DESCRIPTION	New in 1.0	Yes	Yes	Yes	Yes
DEFINE_GATEWAY_HOST HOST_LINK_NAME LU_POOL POOL_NAME NAU_RANGE AUTO_LOGOFF_TIMER DESCRIPTION	New in 1.0	Yes	Yes	Yes	Yes
DEFINE_DEPENDENT_LU_SERVER LINK_NAME ACTIVATE_AT_STARTUP FQ ADJACENT_CP_NAME PU_NAME NODE_ID DESCRIPTION	New in 1.11	Yes+	No	Yes++	Yes++

Note:

+ At least one DEPENDENT_LU_SERVER verb must be predefined in the NDF file.

++ via the DEF_LOGICAL_LINK verb where the adapter is 0 and the DLC type is DLUSVR.



† Realtime Interface Co-Processor

Figure 175. CM Components and APIs (See CM/2 Information and Planning Guide)

```
  SNA     EMUL    ENV                                   MODULE            CNM
 APPL.            MGR    Call       Dial                ENABLER           MGR
                         Status     Utilities


   SNA/APPC SUBSYSTEM

═══════ GDLCI ════════════    ═════════════ CMI ═══════════════

                    X.25 QLLC
                                          CONNECTION
                   ══ X25 ══
                                           MANAGER
 SDLC      IDLC      X.25
 Protocol  Protocol  Packet
 Driver    Driver    Layer      ═════════════ GCCI ═══════════════════
                     - - - - -
                     LAPB

══════════ NDIS ══════════          V-SERIES
                                      PORT                   ISDN
  SDLC      IDLC      X.25         CONNECTION                PCMs
  VMAC      VMAC      VMAC          MANAGERS
                                                          ----------
════════ NDIS ══════════════════════════ SCPI ═══════     ══NDIS══
                                                          ----------
 MPA MAC   ASYNC MAC   AUTOSYNC MAC   WAC MAC    OEM MAC      ISDN MACs


 MPA Adapt     ASYNC Adapter        WAC Adapt   OEM Adapt    ISDN Adapter


     /              /                 /   /        /             BBD
```

GDLCI - Generalized Data Link Control Interface
GCCI - Generalized Call Control Interface
CMI   - Connection Manager Interface
SCPI - Switched Connection Path Interface
NDIS - Network Driver Interface Specifications
ANDIS - Advanced Network Driver Interface Specifications
MAC   - Media Access Control

Figure 176. SNA Phone Connect Components

```
Directory          Description

Root               README.INF
                   CDROM.INF - Describes CD-ROM structure          |

\CM2               CM/2 Product files (All bundles - B*.ZIP files)

\DOCS              Publications
  \INF                in INF format
  \LISTPS             in Postscript format
  \LIST3820           in LIST3820 format
     \LP3820             Utility for printing LIST3820s

\DISKIMGS          Diskette Images
  \CM2PROD           CM/2 Product diskettes (8)
  \CM2AIDS           CM/2 Productivity Aids diskettes (2)
  \CM2APIS           CM/2 API support diskette                     |
  \CM2NETA           CM/2 Network Administrator Sample Programs diskette
  \NTSPROD           NTS/2 Product diskettes (3)

\DFSERVER          Distributed Feature Server files (Unpacked)
  \CMLIB           (Output of CMIMAGE /U)
    \BOOK
    \DLL

\BOOKS             Publications In BookManager format
  \APPCAPPN           APPC APPN Publications
  \REDBOOKS           ITSO Redbooks
  \CM2BOOKS           CM/2 Product Publications
  \READER             Utility for viewing BookManager Pubs
    \INSTALL

\SHELVES           Book shelves for the BookManager pubs

\RSPFILES          Sample Response files                           |

\APISUPP           API Support files

\PRODAIDS          Productivity Aids files

\SOFTERM           Softerm Custom Plus ASCII Emulator

\NTS2              NTS/2 Product files
```

Figure 177. CD-ROM Structure

SYSLEVEL DATA	VERSION	COMPONENT ID	Current CSD Level
CM/2 1.0 GA	Standard Edition 1.00	562125400	WR06000
CM/2 1.00.1 Service Pack	Version 1.00.1	562125400	WR06050
CM/2 1.1 GA	Version 1.1 Title: IBM Communications Manager/2	562207800	WR06000
CM/2 1.11 GA	Version 1.11 Title: IBM Communications Manager/2	562207800	WR06150 US WRG6150 German WRF6150 French WRI6150 Italian WRJ6150 Japanese WRH6150 Korean WRS6150 Spanish WR05999 French
CM/2 1.11 GA	Version 1.11 Title: IBM Communications Manager/2	562207800	WR06150
CM/2 1.11 GA with WARP fixes	Version 1.11 Title: IBM Communications Manager/2 OS/2 WARP	562207800	WR06150
CM/2 1.11 OS2PROD Version	Version 1.11 Title: IBM Communications Manager/2 IBM Internal Use Only	562207800	WR06150

Figure 178. SYSLEVEL Data

```
  CM/2 Version 1.11 - SNA PHONE CONNECT - CONNECTIVITY SUMMARY

 Circuit   Bit    Switched  Protocol    Adapter   Max       Connection to
  Type    Stream    or                  type      Speed
                  Leased                          Kbps/port

            A                                               CM/2
            S     Switched           COM 1-COM x            AS/400(LU62/3270PT)
            Y       or      SDLC        or         57.6(*3) NS/DOS (LU 6.2)
            N     Leased             MPA(*1)                PC/3270
    A       C                                               ADVANTIS for LU 6.2
    N
    A             Switched                                  ADVANTIS 3270EM
    L               or      SDLC     MPA           19.2     S/370, AS/400
    O             Leased                                    CM/2
    G       S
            Y     Switched  SDLC     WAC(RS-232)   19.2
            N       or       or      WAC(V.35)     64
            C     Leased    X.25
                                                            ADVANTIS 3270EM
                            SDLC     WAC(RS422)    64       S/370
                  Leased     or      WAC(X.21)     64       AS/400
                            X.25                            CM/2
                                                            X.25(public/private)
                            SDLC     COM 1-COM x
         AUTOSYNC Switched   or         or         19.2(*2)
                            X.25     MPA(*1)

*1  Or any adapter configured as a serial port
*2  Depends on the modem - Most autosync only support up to 12Kbps
*3  Type 2 COM port is rated at 38.4Kbps. Type 3 COM port at 56Kbps.
```

Figure 179. SNA Phone Connect Connectivity Summary

Index

Numerics
3270 emulation configuration 13
5250 emulation, configuration 16

A
accept incoming calls, DLC - SDLC configuration 34
Accept incoming calls, PCM configuration 22
adapter number, DLC - SDLC configuration 34
ADLCMAC.NIF 33
Advanced Configuration 19
Alternate phone number, configuration 16
ANDIS 175
ANDIS MAC 175
ANDIS PCM support, WAC MAC configuration 41
ARCCI 175
Asynchronous connection 28
Asynchronous non-switched, PCM list 24
Asynchronous switched, example 16
Asynchronous switched, PCM list 23
asynchronous, switched 5
AUTOSTART, in NETWORK.INI 23
AutoSync 6
AutoSync, PCM list 25
AWP0224 5, 28

C
Call Status Application 192
Called party number, configuration 29
Called party number, incoming call configuration 31
CF2 file 44
Cfgname.CFG 44
Cfgname.NDF 44
Cfgname.SEC 44
CMI 174
CMI Interface 202
CMRECORD 44
CMTELNUM 41
CNM Manager 174, 187
COM port 4, 6
COM port MAC, LAPS configuration 32
COM port, maximum number used 5
COMMAC.SYS 9, 33
command mode, MAC 178
Commonly used definitions 12
Communication Network Management (CNM) Manager 174
communication port, serial 4
communications port, serial 6
Components and Interfaces 173
CONFIG.SYS, configuration process 16
Configuration, Advanced 19
configuration, quick 13
Connection Manager (CM) 26
Connection Manager (CXM) 174
Connection Manager Interface 174
Connection Manager, overview 9

D
data flows 173
DDF (Dialog Descriptor File) 53
Dial Utilities 176
Dialog Descriptor File (DDF) 53
Directory, Telephone 41
DLC - SDLC profile 20
DLC - SDLC Using SNA Phone Connection 34
dynamic binding, MAC 179

E
Encoding Scheme 29, 228
Encoding scheme, configuration 16
environment manager 187

F
FFST - Message Log Formatter 197
Files relationship 56
framing standard 28
framing standards 5

G
GCCI 174, 203
GCCI interface 203
Generalized Call Control Interface 174, 203

H
HAMMAC.NIF 33
HAMMAC.SYS 9, 33
high-speed 4

I
IBM MPA adapter 5
IBMWAC.NIF 34
IBMWAC.OS2 34
IDLC protocol 9
Inactivity timeout 16
incoming call directory, configuration 29
Incoming Call Directory, in DLC - SDLC profile 20
Incoming Call Example 191
Interfaces, Components and 173
ISDN support 173
ISDN, PCM list 25

© Copyright IBM Corp. 1995

ISO3309 5, 28

L
LAPS configuration 32
LAPS configuration, for WAC adapter 37
LAPS level 1
Leased (permanent connection), SNA connection 37
Level, MPA 60
Line Mode, WAC MAC configuration 40
Line Speed, WAC MAC configuration 41
local node characteristic 35
Local phone number, PCM configuration 23
logical adapter 20
logical adapters 179

M
MAC device driver, with PCM 20
MAC Drivers, overview 9
MAC entry, in CONFIG.SYS 23
MAC entry, in PROTOCOL.INI 23
MAC for WAC adapter 34
MAC Type, WAC MAC configuration 41
MAC Version, WAC 6
Maximum frame size, WAC MAC configuration 41
Message Log Formatter 197
Minimum number of flags, WAC MAC configuration 41
Modem Connection 14, 17
Modem connection type, configuration 28
Modem connection type, PCM configuration 22
Modem Definitions, for synchronous switched configuration 15
modem parameters 22
modem, synchronous 14
Modem/Line characteristic, configuration 28
Module Enabler 187
MODULE ENABLER tracing 201
MPA adapter 5
MPA Level 60
MPADD.NIF 33
MPADD.SYS 9, 33
Multiple of telephone number, configuration 29

N
NDIS 175
NDIS interface 204
Network Driver Interface Specification (NDIS) 175
NETWORK.INI 44
NETWORK.INI update 56
NETWORK.INI, for PCM list 20
NIF files 51
non-switched (permanent) connection, not required CM 26
NRZI, WAC MAC configuration 40

O
OS/2 version 1
OS2MLOG.DAT message log 197
outgoing call directory entry, automatically created 13
outgoing call directory entry, configuration 27
Outgoing Call Directory Entry, SNA connection 37
Outgoing Call Example 191

P
Part Number, MPA adapter 60, 61
PCM configuration 21
PCM registration 188
PCM, VPCM 173
PCMCIA 19
Permanent connection (leased), SNA connection 37
phone number, Alternate 16
Phone number, configuration 16
PIF files 47
PIF, for PCM list 21
Port Connection Manager 173
Port Connection Manager (PCM) 20
Port Connection Manager, overview 9
Port name, asynchronous COM port configuration 18
Port Name, PCM configuration 22
Port name, synchronous MPA configuration 16
Port number, WAC MAC configuration 40
Portname, WAC MAC configuration 41
PPAT 184
primitives, API 202
profiles, SNA Phone Connect 20
Protocol driver, in PROTOCOL.INI 23
protocol drivers 179
protocol layers, tracing 199
Protocol manager (PROTMAN) 183
protocol mode, MAC 178
Protocol stack, overview 9
PROTOCOL.INI 46
PROTOCOL.INI structure 183
PROTOCOL.INI, configuration process 16

Q
quick configuration 12, 13

R
RS232/V.24, WAC MAC configuration 41

S
SCPI Interface 203
SDLC profile, DLC 20
SDLC protocol 9
SDLC Protocol Driver 32
SDLC using SNA Phone Connections, adapter list 36

serial communication port 4
serial communications port 6
Serial port speed, PCM configuration 22
Slot number, WAC MAC configuration 40
SNA applications 3
SNA Applications, overview 8
SNA connections 35
SNA local node characteristic 35
SNA over Asynchronous 2, 5
SNA Phone Connect profiles 20
SNA/APPC applications 4
SNA/APPC Subsystem, overview 8
SNAPHONE.CXM 9, 27, 41, 44
speed limit 6
speed limit, asynchronous 4
speed limit, synchronous 3
standards, framing 5
Status Window 10
switched asynchronous 5
switched synchronous 6
switched, Asynchronous 16
switched, Synchronous 13
synchronous modem 14
Synchronous non-switched, PCM list 24
Synchronous switched, example 13
Synchronous switched, PCM list 24
synchronous, switched 6
Synchronous/AutoSync parameters 29

T
Telephone Directory 41
trace formatting 201
Trace points 202
trace selection 201
Trace, CM/2 Startup 206
Trace, Module Enabler 206
trace, outgoing call 213
tracing recommendation 202
Tracing with CM/2 199

U
User-Defined Asynchronous Switched Connection 18

V
Version level, WAC MAC 37
virtual port 228

W
WAC adapter 5
WAC adapter, LAPS configuration 37
WAC MAC Version 6
WAC MAC version level 37
WAC Technical Reference, configuration 40

X
X.25 protocol 9

ITSO Technical Bulletin Evaluation RED000

International Technical Support Organization
CM/2 - SNA Phone Connect
March 1995

Publication No. GG24-4385-00

Your feedback is very important to help us maintain the quality of ITSO Bulletins. **Please fill out this questionnaire and return it using one of the following methods:**

- Mail it to the address on the back (postage paid in U.S. only)
- Give it to an IBM marketing representative for mailing
- Fax it to: Your International Access Code + 1 914 432 8246
- Send a note to REDBOOK@VNET.IBM.COM

Please rate on a scale of 1 to 5 the subjects below.
(1 = very good, 2 = good, 3 = average, 4 = poor, 5 = very poor)

Overall Satisfaction ____

Organization of the book	____	Grammar/punctuation/spelling	____
Accuracy of the information	____	Ease of reading and understanding	____
Relevance of the information	____	Ease of finding information	____
Completeness of the information	____	Level of technical detail	____
Value of illustrations	____	Print quality	____

Please answer the following questions:

a) If you are an employee of IBM or its subsidiaries:

Do you provide billable services for 20% or more of your time? Yes____ No____

Are you in a Services Organization? Yes____ No____

b) Are you working in the USA? Yes____ No____

c) Was the Bulletin published in time for your needs? Yes____ No____

d) Did this Bulletin meet your needs? Yes____ No____

If no, please explain:

____

____

What other topics would you like to see in this Bulletin?

____

____

What other Technical Bulletins would you like to see published?

____

Comments/Suggestions: **(THANK YOU FOR YOUR FEEDBACK!)**

____________________ ____________________
Name Address

____________________ ____________________
Company or Organization

____________________ ____________________
Phone No.

Fold and Tape **Please do not staple** Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

IBM International Technical Support Organization
Department 545, Building 657
P.O. BOX 12195
RESEARCH TRIANGLE PARK NC
USA 27709-2195

Fold and Tape **Please do not staple** Fold and Tape

Printed in U.S.A.

GG24-4385-00

Artwork Definitions

id	File	Page	References	
ITSLOGO	4385SU	i		i

Table Definitions

id	File	Page	References	
TT2	4385ENV	182		183, 183
NDF	4385ASUM	248		248

Figures

id	File	Page	References	
ASYNAUT	4385OVER	2	1	2
SYNC2	4385OVER	3	2	3
ASYAUT	4385OVER	6	3	
COMSUM	4385OVER	8	4	
MAIN1	4385CFGO	11	5	11
MAIN2	4385CFGO	12	6	12
W32701	4385CFGO	14	7	13
W32702	4385CFGO	15	8	14
PNES	4385CFGO	15	9	15
W52501	4385CFGO	17	10	
W52502	4385CFGO	18	11	
ADVCFG	4385CFGO	20	12	
PCMCFG	4385CFGO	21	13	22, 24
MDM7855	4385CFGO	22	14	20, 21, 48
ANS	4385CFGO	24	15	
SS	4385CFGO	24	16	
SNS	4385CFGO	25	17	
A	4385CFGO	25	18	
ISDN	4385CFGO	26	19	
CMCFG	4385CFGO	26	20	26
OCDE	4385CFGO	27	21	27
MDMC	4385CFGO	28	22	28
CPART	4385CFGO	29	23	29
ICDE	4385CFGO			

		29	24	
ICDENAM	4385CFGO	30	25	29, 30
ICDENEW	4385CFGO	30	26	29
ML	4385CFGO	31	27	30
LCLPH	4385CFGO	31	28	
PI	4385CFGO	32	29	
LAPS1	4385CFGO	33	30	
LAPS2	4385CFGO	33	31	
SNACON	4385CFGO	34	32	51
LNODE	4385CFGO	35	33	
LNODEO	4385CFGO	35	34	
CONNLST	4385CFGO	36	35	
ADPLST	4385CFGO	36	36	
CONNPN	4385CFGO	37	37	
WACDD	4385CFGO	38	38	36
INSTCOM	4385CFGO	38	39	
WACCFG	4385CFGO	39	40	
WACPARM	4385CFGO	40	41	
TELDIR	4385CFGO	42	42	
TELNUM	4385CFGO	42	43	
CONF	4385CFGF	43	44	
NETINI	4385CFGF	45	45	44
PROTINI	4385CFGF	47	46	
PIF	4385CFGF	49	47	
PCM7855	4385CFGF	50	48	
NIF	4385CFGF	52	49	
COMMAC	4385CFGF	53	50	
DDFFILE	4385CFGF	55	51	
NI	4385CFGF	56	52	
FR	4385CFGF	57	53	
NFR	4385CFGF	58	54	56
DDFREL	4385CFGF	59	55	57
MPA	4385SMPA	63	56	
3270CFG	4385SMPA	64	57	63
SMCI	4385SMPA	65	58	
3271CFG	4385WAC2	71	60	
3272CFG	4385WAC2	72	61	
327WAC	4385WAC2	75	62	76
SMCIWAC	4385WAC2	76	63	

				74
CHARGE	4385A400	79	64	79
CMDEF	4385A400	80	65	
5250CFG	4385A400	81	66	
MDMCON	4385A400	82	67	
FICABLE	4385A400	87	69	
APS2	4385APS2	89	70	89
APPCCFG	4385APS2	90	71	
CMPL	4385APS2	91	72	
PCMAPPC	4385APS2	91	73	92, 92
7855APC	4385APS2	92	74	
CMAPPC	4385APS2	93	75	
OOCDE	4385APS2	93	76	
MLAPPC	4385APS2	94	77	94
CPNAPPC	4385APS2	94	78	
CMQC	4385APS2	94	79	
ICDN	4385APS2	95	80	
SDLCDCL	4385APS2	95	81	
LNCHAR	4385APS2	96	82	
CONLIST	4385APS2	97	83	
ADPLIST	4385APS2	97	84	
CONPLU	4385APS2	98	85	
CONLU	4385APS2	99	86	
SNAAPH	4385SNAA	103	87	
SNAALO	4385SNAA	104	88	
SNAAQK1	4385SNAA	105	89	104
SNAAQK2	4385SNAA	105	90	105
SNAAQK3	4385SNAA	106	91	
SNAAQK4	4385SNAA	107	92	106
CBA1	4385SNAA	111	95	
CBA2	4385SNAA	111	96	
SNAPCM5	4385SNAA	112	97	
SNACXM5	4385SNAA	112	98	
SNACXM6	4385SNAA	113	99	
SNACXM7	4385SNAA	113	100	
SNADLC5	4385SNAA	114	101	
SNAIMP1	4385SNAA	115	102	
SNAIMP2	4385SNAA	115	103	
SNAIMP3	4385SNAA	116	104	
AUTO	4385ATTP	117	105	117

PATW1	4385ATTP	119	106	
PATW2	4385ATTP	119	107	
3270AUT	4385ATTP	121	108	
AUTOMDM	4385ATTP	122	109	
FULDUP	4385MDMO	131	112	130
PMT00	4385ATCM	165	131	
PMT01	4385ATCM	166	132	
PMT02	4385ATCM	166	133	
PMT03	4385ATCM	167	134	
SNAENV	4385ENV	177	138	8, 173
C721	4385ENV	178	139	178
C7DRVX	4385ENV	180	140	
C7DRVS	4385ENV	180	141	180
C7ENV2	4385ENV	182	142	178, 184
C7PRINI	4385ENV	185	143	183, 188
C7NWINI	4385ENV	188	144	187
C7ACTIV	4385ENV	190	145	187, 206, 206
C7STAT1	4385ENV	192	147	192
C7STAT2	4385ENV	193	148	193
S7CALL1	4385ENV	194	149	191
C7CALL2	4385ENV	195	150	191, 194, 213, 213
C7CALL3	4385ENV	196	151	191, 195
C8LOG1	4385PHPD	198	152	197
C8LOG2	4385PHPD	198	153	198
C8OSI	4385PHPD	199	154	199
C8TRC1	4385PHPD	200	155	199
C8TRCPT	4385PHPD	201	156	201
C8PRIM	4385PHPD	205	157	202
C8ME1	4385PHPD	207	158	
C8ME2	4385PHPD	208	159	
C8ME3	4385PHPD	209	160	
C8ME4	4385PHPD	210	161	
C8ME5	4385PHPD	211	162	
C8ME6	4385PHPD	212	163	

C83270	4385PHPD	213	164 213, 220
C8OUT1	4385PHPD	214	165
C8OUT2	4385PHPD	215	166
C8OUT3	4385PHPD	216	167
C8OUT4	4385PHPD	217	168
C8OUT5	4385PHPD	218	169
C8OUT6	4385PHPD	219	170
C8FAIL1	4385PHPD	221	171
C8FAIL2	4385PHPD	222	172
C8FAIL3	4385PHPD	223	173 220
C8IRQ	4385PHPD	225	174

Headings

id	File	Page	References
NOTICES	4385FM	xv	Special Notices ii
BIBL	4385PREF	xviii	Related Publications
CH1OVER	4385OVER	1	Chapter 1, SNA Phone Connect Overview xvii, 63, 70, 79, 89, 117
CH1WIS	4385OVER	1	1.1, What Is SNA Phone Connect?
CH1HD	4385OVER	3	1.2, Why SNA Phone Connect?
FPBSPC	4385OVER	4	1.3, Functions Provided by SNA Phone Connect
ASYNC	4385OVER	4	1.3.1, Asynchronous SNA Phone Connections
SYNC	4385OVER	5	1.3.2, Synchronous SNA Phone Connections
AUTO	4385OVER	6	1.3.3, AutoSync SNA Phone Connections
ISDN	4385OVER	7	1.3.4, ISDN SNA Phone Connections
X25	4385OVER	7	1.3.5, X.25 Enhancements
OSPCCOM	4385OVER	8	1.4, SNA Phone Connect Components
CALLSTA	4385OVER	10	1.5, Call Status Window
CM2CONF	4385CFGO	11	Chapter 2, CM/2 SNA Phone Connect Configuration xvii, 1, 63, 70, 79, 89, 117
CMMAIN	4385CFGO	11	2.1, Selecting Commonly Used Definitions
ADMAIN	4385CFGO	12	2.2, Selecting Additional Definitions
QCFG	4385CFGO	13	2.3, Quick Configuration
ADVCFG	4385CFGO	19	2.4, Advanced Configuration 16, 19
PCMPROF	4385CFGO	20	2.4.1, SNA Phone Connect - Port Connection Manager
CMPROF	4385CFGO	26	2.4.2, SNA Phone Connect - Connection Manager 94
PIPROF	4385CFGO	32	2.4.3, SNA Phone Connect - Protocol Driver
LAPS	4385CFGO	32	2.4.4, LAPS Configuration
DLCSDLC	4385CFGO	34	2.4.5, DLC - SDLC Using SNA Phone Connection 20, 22
SNALNC	4385CFGO	35	2.4.6, SNA Local Node Characteristics
SNACON	4385CFGO		

		35	2.4.7, SNA Connections	
WACLAPS	4385CFGO	37	2.5, LAPS Configuration for WAC Adapter	22, 34
TELDIR	4385CFGO	41	2.6, Telephone Directory	
SNAPC	4385CFGF	43	Chapter 3, SNA Phone Connect Configuration Files	xvii, 1
CONFFL	4385CFGF	43	3.1, Configuration Files	
FILES	4385CFGF	56	3.2, File Relationships	48
COMPORT	4385CFGF	60	3.3, Standard COM Port and IRQ Level Definition	224
MPALVL	4385CFGF	60	3.4, Latest MPA Level	1, 226
SMPA	4385SMPA	63	Chapter 4, Configuration Example - Synchronous to a 3745 Using an MPA Adapter	xvii
CSMPA	4385SMPA	63	4.1, CM/2 Configuration Process	
RF	4385SMPA	66	4.2, Related Files	
SWAC	4385WAC2	69	Chapter 5, Configuration Example - Synchronous to a 3745 Using a WAC Adapter	xvii
S1PA	4385WAC2	70	5.1, LAPS Configuration Process	
SMPACFG	4385WAC2	75	5.2, CM/2 Configuration Process	
WACRF	4385WAC2	77	5.3, Related Files	
A400	4385A400	79	Chapter 6, Configuration Example - Asynchronous to an AS/400	xvii
HILITE2	4385A400	79	6.1, CM/2 Configuration Process	
A400RF	4385A400	83	6.2, Related Files	
APS2	4385APS2	89	Chapter 7, Configuration Example - APPC from PS/2 to PS/2 over an Asynchronous Connection	xvii
CMCFGP	4385APS2	89	7.1, CM/2 Configuration Process	
PSD	4385APS2	89	7.1.1, Configuration for Workstation #1	
PSA	4385APS2	99	7.1.2, Configuration for Workstation Number 2	
TESTCFG	4385APS2	99	7.2, Testing the Newly Created Configurations	
PS2RF	4385APS2	100	7.3, Related Files	
SNAA	4385SNAA	103	Chapter 8, Configuration Example - SNA over Asynchronous to a CM/2 Gateway/Network Node	
SNAACFG	4385SNAA	103	8.1, Scenario Description	
SNAAPHY	4385SNAA	103	8.1.1, Physical Description	
SNAALOG	4385SNAA	103	8.1.2, Logical Description	
AUT	4385ATTP	117	Chapter 9, Configuration Example - ThinkPad with a PCMCIA Autosync Modem to a 3745	xviii
WHATBF	4385ATTP	117	9.1, Special Considerations for PCMCIA	
WHATDIF	4385ATTP	118	9.2, Using PlayAtWill	
AUTOCMP	4385ATTP	120	9.3, CM/2 Configuration Process	
AUTORF	4385ATTP	123	9.4, Related Files	
CONSYS	4385ATTP	123	9.4.1, CONFIG.SYS	118
MDMO1	4385MDMO	129	Chapter 10, Communications Terminology and Tutorial	xviii

MDMO2	4385MDMO	130	10.1, Half-Duplex/Full-Duplex Transmissions
MDMO03	4385MDMO	131	10.2, Point-to-Point and Multipoint
MDMO05	4385MDMO	132	10.3, Asynchronous and Synchronous
MDMO04	4385MDMO	134	10.4, Analog vs Digital
MDMO06	4385MDMO	134	10.5, Modulation
MDMO09	4385MDMO	138	10.6, Interfaces
MDMO07	4385MDMO	147	10.7, Comparing NRZI Encoding Scheme to NRZ
MDMO08	4385MDMO	148	10.8, SDLC Zero-Bit Insertion and Deletion
INTRO	4385ATCM	149	Chapter 11, The AT Command Set xviii
AT1	4385ATCM	149	11.1, Modem Attention Command Set (AT Command)
AT2	4385ATCM	149	11.2, AT Commands
AT3	4385ATCM	150	11.3, S-register
AT4	4385ATCM	150	11.4, Result Codes
AT5	4385ATCM	152	11.5, AT Commands Quick Reference
AT6	4385ATCM	158	11.6, AT Commands Considerations and Examples
AT7	4385ATCM	164	11.7, Data Compression
AT8	4385ATCM	164	11.8, PM Terminal
AT9	4385ATCM	167	11.9, Modem Leads
AT10	4385ATCM	169	11.10, Modem Leads Descriptions
V25BIS	4385ATCM	170	11.11, CCITT V.25 bis
CM2ENV	4385ENV	173	Chapter 12, Communications Manager/2 SNA Phone Connect Environment xviii, 199
ENV	4385ENV	173	12.1, SNA Phone Connect - Major Components and Interfaces
STROS2	4385ENV	177	12.2, Main Events at OS/2 Boot Time
LAPSOVR	4385ENV	178	12.2.1, LAPS Overview
C722	4385ENV	178	12.2.2, SNA Phone Connect NDIS MAC Support
C723	4385ENV	182	12.2.3, PROTOCOL.INI File
STARTCM	4385ENV	187	12.3, Main Events at CM/2 Start Time
CALLING	4385ENV	191	12.4, Outgoing Call and Incoming Call Flow Examples
OUTGO	4385ENV	191	12.4.1, Outgoing Call
INCOM	4385ENV	195	12.4.2, Incoming Call
PD	4385PHPD	197	Chapter 13, Problem Determination for SNA Phone Connect xviii, 53
C8PDLOG	4385PHPD	197	13.1, Message Log Formatter
PDCMTRC	4385PHPD	199	13.2, CM/2 Tracing
C821PRI	4385PHPD	202	13.2.1, APIs and Primitives 189
C822STR	4385PHPD	206	13.2.2, Sample Trace of CM/2 Startup
C823OUT	4385PHPD	213	13.2.3, Sample Trace of an Outgoing Call
C824OUT	4385PHPD	220	13.2.4, Sample Trace of a Failed Outgoing Call
C84	4385PHPD	223	13.3, PD Hints and Tips
C841	4385PHPD	224	13.3.1, SNA Phone Connect Checklist
C842	4385PHPD	224	13.3.2, OS/2 Boot Errors
C842A	4385PHPD	225	13.3.3, CM/2 Start Errors

C842B	4385PHPD	226	13.3.4, Link Does Not Activate
C8421	4385PHPD	226	13.3.4.1, Hardware Configuration
C8422	4385PHPD	226	13.3.4.2, Modem and Cable Configuration
C8423	4385PHPD	227	13.3.4.3, CM/2 Configuration
C843	4385PHPD	229	13.3.5, Link Has Dropped
HANDT	4385APHT	231	Appendix A, Hints and Tips and Restrictions xviii
CM2SUM	4385ASUM	235	Appendix B, Communications Manager/2 Reference Summary xviii

Spots

id	**File**	**Page**	**References**
SAMPLE2	4385CFGO	18	(no text) 21
ABC123	4385CFGO	31	(no text) 23

Tables

id	**File**	**Page**	**References**
DDF	4385CFGF	53	1
MPA	4385CFGF	60	2
C7PDRIV	4385ENV	180	3
S7MDRIV	4385ENV	181	4
C7SAMP1	4385ENV	183	5 183, 191
C7SAMP2	4385ENV	183	6 183, 191
C8CMIPR	4385PHPD	203	7 202
C8GCCIP	4385PHPD	203	8 203

Processing Options

Runtime values:

Document fileid	GG244385 SCRIPT
Document type	USERDOC
Document style	IBMXAGD
Profile	EDFPRF30
Service Level	0029
SCRIPT/VS Release	4.0.0
Date	95.04.04
Time	10:01:18
Device	3820A
Number of Passes	3
Index	YES
SYSVAR D	YES
SYSVAR G	INLINE
SYSVAR V	ITSCEVAL

Formatting values used:

Annotation	NO
Cross reference listing	YES
Cross reference head prefix only	NO
Dialog	LABEL
Duplex	YES
DVCF conditions file	(none)
DVCF value 1	(none)
DVCF value 2	(none)
DVCF value 3	(none)
DVCF value 4	(none)
DVCF value 5	(none)
DVCF value 6	(none)
DVCF value 7	(none)
DVCF value 8	(none)
DVCF value 9	(none)
Explode	NO
Figure list on new page	YES
Figure/table number separation	YES
Folio-by-chapter	NO
Head 0 body text	Part
Head 1 body text	Chapter
Head 1 appendix text	Appendix
Hyphenation	NO
Justification	NO
Language	ENGL
Layout	OFF
Leader dots	YES
Master index	(none)
Partial TOC (maximum level)	4
Partial TOC (new page after)	INLINE
Print example id′s	NO
Print cross reference page numbers	YES
Process value	(none)
Punctuation move characters	.,
Read cross-reference file	(none)
Running heading/footing rule	NONE
Show index entries	NO
Table of Contents (maximum level)	3
Table list on new page	YES
Title page (draft) alignment	RIGHT
Write cross-reference file	(none)

Imbed Trace

```
Page 0          4385SU
Page 0            4385VARS
Page 0          4385FM
Page i            4385EDNO
Page ii           4385ABST
Page xv           4385SPEC
Page xv           4385TMKS
Page xvi          4385PREF
Page xix          4385ACKS
Page xx         4385OVER
Page 10         4385CFGO
Page 42         4385CFGF
Page 61         4385SMPA
Page 68         4385WAC2
Page 78         4385A400
Page 87         4385APS2
Page 101        4385SNAA
Page 116        4385ATTP
Page 127        4385MDMO
Page 148        4385ATCM
Page 171        4385ENV
Page 196        4385PHPD
Page 230        4385APHT
Page 234        4385ASUM
Page 259        4385EVAL
Page 259        RCFADDR
Page 259          ITSCADDR FILE
Page 261        RCFADDR
Page 261          ITSCADDR FILE
```